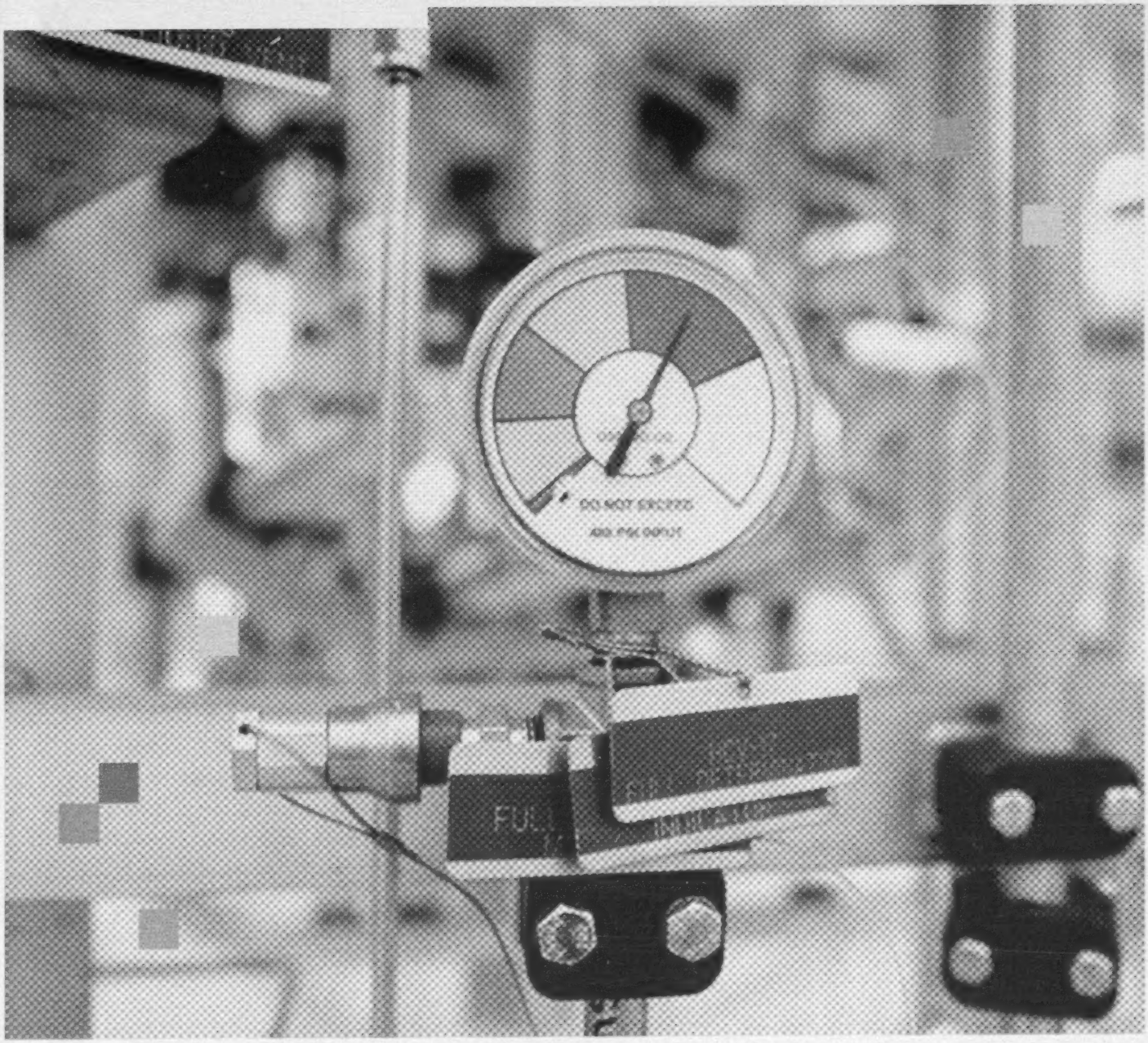
State of Safety Report 2010

Safety Authority

British Columbia Safety Authority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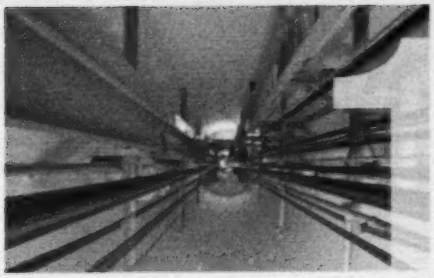
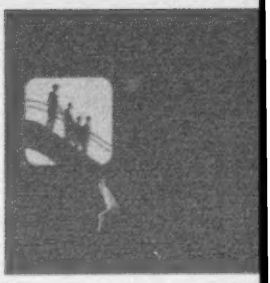
Message from the Chair





The data in this report has been diligently collected and analyzed to expand the body of knowledge that we use and share with industry to prevent accidents and manage risks.

I am pleased to present the 2010 State of Safety Report of the BC Safety Authority. This report provides data and analysis about issues, hazards and trends that exist in our province's technical safety system. By sharing information, we believe that government, industry and the general public can benefit and collaborate to enhance safety in British Columbia.

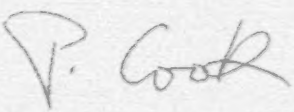
As the Province's delegated authority to provide oversight to technical safety services, we remain firm in our commitment to be transparent and accountable. We believe that it is in everyone's best interest to be informed of British Columbia's state of safety. The data in this report has been diligently collected and analyzed to expand the body of knowledge that we use and share with industry to prevent accidents and manage risks.

Ours is a dynamic province. We are challenged by the changes that we see in industry, technology and the regulatory environment. And we continue to be tested by an economy that has not stabilized. But through it all, we see opportunities and are confident that British Columbia's state of safety will not be compromised.

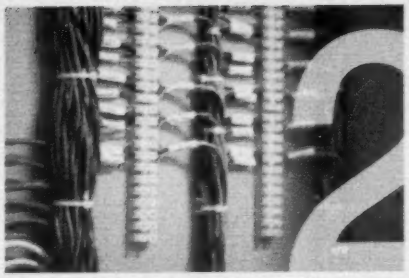
I would like to thank Harry Diemer, founding President and Chief Executive Officer, for his dedicated and conscientious service to the BC Safety Authority. His leadership and vision created a solid reputation in safety regulation. Harry retired at the end of March 2011. He left the BC Safety Authority in a strong position to move forward into a new era of safety innovation. The Board of Directors conducted a comprehensive and rigorous search process and the President and Chief Executive Officer position was assumed by Catherine Roome, our Chief Operating Officer since 2007.

I thank my fellow Board Members, the Executive Team and BC Safety Authority staff for their passion and dedicated work to keeping our province safe. ■

Sincerely,
Peter Cook



Chair of the Board



Message from the President and Chief Executive Officer*

In 2010, we continued to evolve education and outreach, enforcement, inspection and research into each and every technology we regulate.

The safety system we manage for British Columbia is vast and complex. It is a system that runs through seven unique technologies with countless pieces of equipment in installations and operations across the province. But more importantly, it is a system that involves the expertise of contractors, stakeholders and government, and impacts businesses, homes and families.

This report reveals the depth and scope of our safety system. While the facts and figures draw attention to hazards and incidents, the bigger picture shows that our province is safe. British Columbia's state of safety confirms we are meeting our goal of preventing accidents and managing risks.

In 2010, we continued to evolve education and outreach, enforcement, inspection and research into each and every technology we regulate. This has been our operational philosophy since we started focusing on implementing an accident prevention and service delivery model anchored on risk control. These past years, we have been enhancing our safety system to identify and manage high-risk areas to minimize, if not eliminate, associated hazards.

We actively involved industry in several consultation sessions to ensure that our decisions and initiatives were relevant and current. Together with Technology Advisory Committees, we looked at safety issues that needed to be addressed. Not only did this collaboration add to our efforts at maintaining transparency, it gave us access to a wealth of knowledge coming from those who worked the safety system from different perspectives.

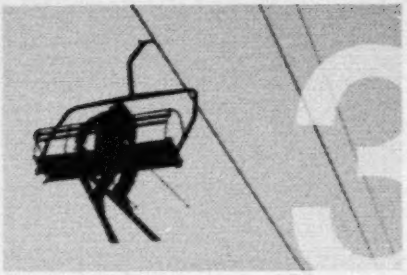
I would like to acknowledge my colleagues and the employees at the BC Safety Authority. Through all these years, we have shared a passion for safety and have worked hard to build an organization that truly focuses on safety in our province. I would also like to thank the Board of Directors for providing guidance and direction.

Harry Diemer

President and Chief Executive Officer

*(retired March 2011)

About this Report



The report provides a summary of the outcomes of inspections, assessments and investigations carried out by our safety officers.

The 2010 State of Safety Report is the seventh publication on the state of safety for all technologies overseen by the BC Safety Authority. The report provides a summary of the outcomes of inspections, assessments and investigations carried out by our safety officers. Also included is an overview of reported incidents between January 1, 2010 and December 31, 2010 in each regulated technology.

Data Collection and Analysis

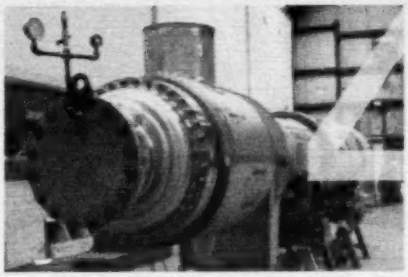
The data included within this report was obtained from BC Safety Authority's incident investigation records and safety officer inspection reports for 2010[1]. This report describes the distribution and characteristics of the incidents that occurred in 2010, provides details on the injuries and fatalities in the regulated technologies, and outlines the activities conducted to prevent additional incidents or mitigate the consequences of future incidents. In addition to highlighting safety risks, this report identifies areas where safety can be improved.

The data obtained from activity carried out in 2010 is compared to data collected from 2007 and later. Data collection and its analysis over time are critical to the understanding of safety risks and how best to control them. The analysis of this data is used to develop accident prevention strategies in the regulated industry sectors. ■

[1]The Province of British Columbia has entered into agreements with authorities other than BC Safety Authority to provide inspection and incident investigation services for specific regions or industries as described below:

- Ten municipalities in British Columbia have agreements to administer portions of the *Safety Standards Act*; eight municipalities administer all aspects of the *Electrical Safety Regulation* and seven municipalities administer the *Gas Safety Regulation* for specific sizes and types of equipment. These municipalities are listed in the Appendix to this report.
- In accordance with an agreement with the Province, incidents for common carrier railways are reported to and investigated by the Transportation Safety Board of Canada.

The inspection and incident investigation data from these authorities, while analyzed, has not been included in this report.



Improving Safety

Service delivery model based on risk concentrates on four areas or "pillars" to support the safety system: Education and Outreach, Inspection, Research and Enforcement.

Since 2008, the BC Safety Authority has shifted resources to the implementation of our operating model, an accident prevention and service delivery model based on risk control. This model concentrates on four areas or "pillars" to support the safety system: Education and Outreach, Inspection, Research and Enforcement.

Education and Outreach

To increase the flow of information and knowledge between the BC Safety Authority, the public and industry through awareness campaigns, information sessions, code updates, bulletins, our website and on worksites.

Inspection

To use risk-based inspection services to promote hazard prevention and promote duty holders' responsibility for the risks they create.

Research

To conduct data gathering and analysis, enabling the BC Safety Authority to identify hazards and trends that will help industry to act and prevent incidents before they occur.

Enforcement

To "level the playing field" and increase the accountability of non-compliant contractors, equipment owners and others doing regulated work.

Implementing the model means a shift in our approach from a reliance on inspection for code conformance as the primary safety tool to a multifaceted safety system designed to focus our resources on higher-risk areas. We systematically identify high risk exposures and reduce the associated hazards to prevent accidents. In other words, our risk management process identifies potential risks that may impact public safety. Sources of risks usually involve the users, owners of regulated equipment and systems, and the individuals we certify. The safety managers and safety officers carry out their duties to identify risks, develop control plans and monitor progress.

Improving Safety

Education and Outreach

In 2010, we worked toward further integrating our education and outreach areas of our operating model. We continued the advancement of our preventative operating model in which stakeholders (both internal and external) played an important role in both the identification of risk and the risk reduction of safety issues. The 'outreach' division, or stakeholder engagement division, has the objective of promoting stakeholder participation through education programs and engagement practices that create mutual value, clarify accountability and support learning and innovation.

One of the engagement practices is the Technology Advisory Committees. These committees, comprised of volunteers acting as technology-specific experts, identify and advise on issues related to technical safety, regulatory changes and service delivery improvements. The committees generally meet quarterly and act as a "sounding body" for both operations and the policy program. It is through this involvement of stakeholders, as experienced experts in their respective technical fields, that we are able to continuously learn and be innovative in our respective safety programs.

While discussions at Technology Advisory Committee meetings result in many action items, few result in the development of Risk Reduction Working Groups. These 'working groups' address a specific issue and result in recommendations to us for either regulatory, policy or service delivery changes.

A broader explanation of stakeholder engagement and specific descriptors of the 2010 Risk Reduction Working Groups can be found under the Definitions section of this report and in our *2010 Annual Report on Safety Regulations*.

Enforcement

In 2010, a total of 192 enforcement actions were taken against companies and individuals performing regulated work under BC Safety Authority jurisdiction.

In 2010, our provincial safety managers imposed 14 monetary penalties, the most penalties imposed in a single year. When compared to the activities in 2009 and in 2010, there was a 180 percent increase in monetary penalties imposed. Six of the monetary penalties were imposed for failure to comply with a safety order, four were imposed for failure to comply with a compliance order, and in the remaining four cases, the regulated work was performed without valid permission.

Safety officers and safety managers issued 173 compliance orders in 2010, which is 25% lower than the average number of 235 compliance orders issued over the past four years. When compared to the number of compliance orders issued in 2009, there were 55% fewer compliance orders issued in 2010.

As reported in the 2009 edition of the State of Safety Report, the *Electrical Safety Regulation* requires permit holders to request an inspection within 180 days after permit issuance. If extra time is required to complete the installation, the permit holder must have the permit amended or it expires. In the past, safety officers would suspend a contractor's ability to obtain new permits until the expired permits were resolved; however, the Safety Standard Appeal Board ruled that permit suspensions could not be used to enforce expired permit requirements. The implementation of this ruling is reflected in the severe decrease of suspended permit privileges: 325 suspensions in 2008; 42 suspensions in 2009; and three suspensions in 2010. ■

Figure 1: Enforcement Activities 2007-2010

ENFORCEMENT ACTION	2010	2009	2008	2007
Compliance Order	173	308	286	173
Suspended Authorization and Permit Privileges	0	0	1	7
Suspended Authorization Privileges	2	0	7	9
Suspended Permit Privileges	3	42	325	374
Revocation of a Contractor's Licence	0	1	0	3
Suspension of a Contractor's Licence	0	2	4	0
Revocation of a Certificate of Qualifications	0	0	1	2
Suspension of a Certificate of Qualifications	0	3	3	1
Monetary Penalty	14	5	5	0

Figure 2: Enforcement Activity by Technology 2010

ENFORCEMENT ACTION	AMUSEMENT RIDES	BOILER, PV AND REFRIGERATION	ELECTRICAL	ELEVATING DEVICES	GAS	PASSENGER ROPEWAYS	TOTAL
Compliance Order	4	6	96	8	58	1	173
Suspended Authorization and Permit Privileges	0	0	0	0	0	0	0
Suspended Authorization Privileges	0	0	2	0	0	0	2
Suspended Permit Privileges	0	0	2	1	0	0	3
Revocation of a Contractor's Licence	0	0	0	0	0	0	0
Suspension of a Contractor's Licence	0	0	0	0	0	0	0
Revocation of a Certificate of Qualifications	0	0	0	0	0	0	0
Suspension of a Certification of Qualifications	0	0	0	0	0	0	0
Monetary Penalty	2	0	3	7	2	0	14

Our Technologies

At BC Safety Authority, we regulate seven technologies. We assess new as well as operating equipment, issue licences to contractors and issue certificates of qualification to workers.

At BC Safety Authority, we regulate seven technologies. We assess new as well as operating equipment, issue licences to contractors and issue certificates of qualification to workers. In 2010, we completed more than 58,000 assessments and we have on register more than 8,300 licenced contractors across all technologies and more than 64,000 individuals with certificates of qualification.

Amusement Rides

We are responsible for verifying the safe installation and operation of amusement rides in British Columbia, including rides operated by traveling amusement (carnival) companies that move between provinces.

Boilers, Pressure Vessels and Refrigeration Systems

We oversee the design, construction and operation of steam and hot water boilers, refrigeration units and pressure vessels throughout the province. We license contractors who install and repair this equipment, and certify power engineers who operate them.

Electrical

We are responsible for overseeing electrical installations at commercial, industrial and residential sites throughout British Columbia, except in those areas where the municipalities provide inspection services[1]. We administer a licensing program for all electrical contractors in the province and certify all Field Safety Representatives[2], authorizing them to accept the responsibility for ensuring that electrical contractors complete their work in accordance with the *Electrical Safety Regulation*.

Escalators and Elevators

We oversee the safety of passenger elevators, freight elevators, escalators, moving walks, lifts for individuals with physical disabilities, and construction hoists in the province. Our staff conducts design reviews, field verifications of new installations and risk-based inspections of existing units. We also register the contractors who work on elevating devices equipment.

Natural Gas and Propane

We are responsible for overseeing the safe use of natural gas and propane, and digester, landfill and hydrogen gases at commercial, industrial and residential sites. We certify all gas trade professionals and license all contractors in British Columbia. Inspections of installations generally categorized as residential sites[4] are done by some municipalities[5]; however, we conduct inspections of all other gas equipment in the province.

Passenger Ropeways

We regulate tramways, gondolas, chairlifts, T-bars and tow ropes across the province. In addition to conducting safety inspections of new and existing units, we also work with industry associations and educational institutions to deliver safety training programs to passenger ropeway operators.

Railways

We regulate provincially certified railways operating in British Columbia through a compliance program consisting of audits and inspections to certify that railways conduct their operations safely. These railways include common carrier railways, industrial railways, heritage railways and commuter railways. ■

[1] See Appendix A for a complete listing of municipalities that administer portions of the *Safety Standards Act*.
[2] A "Field Safety Representative" is an individual who holds a certificate of qualification issued under the *Safety Standards General Regulation*.
[4] Not exceeding 14 kPa pressure or a load of 120 KW.
[5] See Appendix A for a complete listing of municipalities that administer portions of the *Safety Standards Act*.

Incidents Summary

The BC Safety Authority received 597 incident notifications in all technologies in 2010.

Incidents reported to us are classified and analyzed based on their severity. Railway incidents are the exception because, unlike the other technologies, provincial railways are administered under the *Railway Safety Act*. An agreement between the Province of British Columbia and the Transportation Safety Board of Canada has established federal reporting requirements for railways. This requirement means commuter and industrial railway incidents are reported us, but the incidents may have not been classified by their severity.

Reported Incidents

The BC Safety Authority received 597 incident notifications in all technologies in 2010. We may receive notifications that fall beyond our mandate. For example, we may receive notifications where, at the time of reporting, it is unknown if regulated work or regulated equipment is involved. Still, these instances are investigated by technical staff but the investigation may conclude that regulated work or equipment may not be the primary or contributing cause. Out of the 597 notifications, 478 were directly related to regulated work or regulated products.

Figure 3: Incident Notifications by Technology

TECHNOLOGY	NOTIFICATIONS RECEIVED BY BCSA
Amusement Rides	22
Boilers, Pressure Vessels and Refrigeration	18
Electrical	151
Elevating Devices	34
Gas	78
Passenger Ropeways	103
Railways	191
Total	597

Incidents Summary

Comparing 2010 with Previous Years

When compared to the 2009 figures, there was an 18% increase in reported incidents. Over the past several years, BC Safety Authority worked to educate industry and stakeholders on the importance of reporting incidents (and near-miss incidents). Our internal reporting processes have also improved over time and as a result we are reporting increased notifications.

An increase in incident notifications is positive as the number of incident notifications received partially reflects the industry's focus on safety and dedication to capturing safety statistics for prevention purposes, as well as its knowledge of reporting requirements. A technology with an effective safety management system should report approximately 100 more incidents with no injury, than incidents with severe (or major) injury.

Figure 4: Incident Notifications 2007-2010

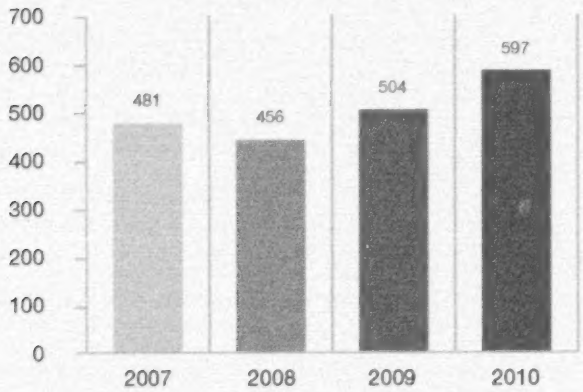
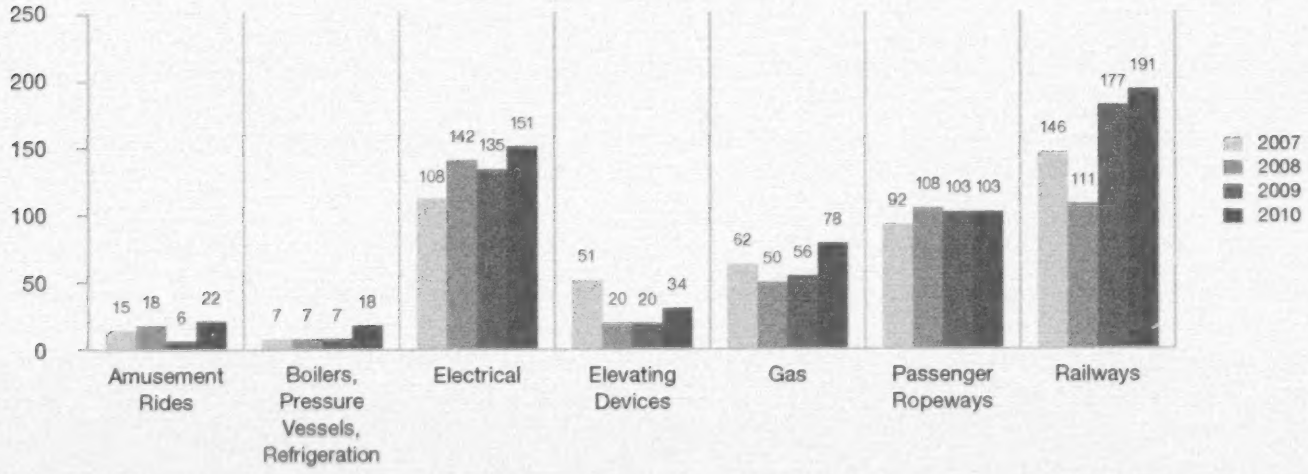


Figure 5: Incident Notifications by Technology 2007-2010



Incidents Summary

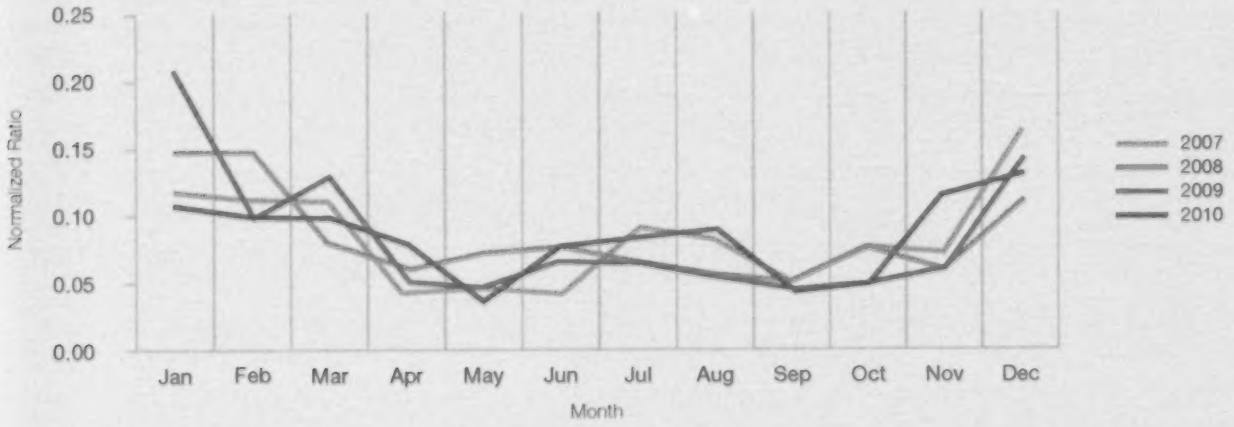
The incident data collected from 2007 to 2009 identified a strong seasonal pattern. This pattern, below in Figure 6 titled *Monthly Incident Pattern 2007-2010,* was similar in 2010 despite a marked increase in reported incidents. Winter continued to show the highest occurrence of incidents and we determined that operation of passenger ropeways at ski resorts – combined with appliances for space heating and supplemental heating – resulted in a higher number of incidents during the winter months, typically during the first three months of the year.

The increased and heavy use of portable propane appliances such as camp stoves, barbecues and lanterns during the summer camping season corresponds to a rise in the number of incidents in of July and August.

Knowledge of this pattern is invaluable in determining the content and timing of public education programs, as well as identifying user groups who may benefit from our safety awareness programs.

For example, in 2010, the Gas Safety Program completed a study into incidents involving carbon monoxide poisonings. The findings from this study will not only direct our work in 2011 and but allow us to monitor the effectiveness of our programs. More information about this review is in the Gas section of this report.

Figure 6: Monthly Incident Pattern 2007-2010



Incidents Summary

Fatalities and Injuries

Injuries are classified[1] by severity, according to whether the following indicators are present:

- long-term impairment of body functions or loss of function
- significant physical pain and some disability
- professional medical attention is required
- any residual effect

Injuries resulting from incidents are summarized as minor, major, or fatal based on their classification. Non-permanent injuries that may require some medical (first aid) treatment are classified as minor injuries. This includes lacerations, contusions, abrasions or any other injuries that have no residual effect. A major injury requires medical attention and involves long-term impairment of function, or loss of function of any body part, organ or mental faculty. This includes fractures, internal injuries or wounds that are serious but not life threatening, and psychological trauma that results in some temporary or partial disability. Injuries are not recorded in cases where an investigation ruled out regulated equipment as the cause of the incident.

In 2010, there were 139 injuries and 7 fatalities. Of the 139 injuries, 107 (77%) were minor injuries and 32 were major injuries consisting of fractures, second- and third- degree burns, and exposure to carbon monoxide.

There were seven incidents resulting in fatalities: one incident in the boiler, pressure vessel and refrigeration technology, one in the passenger ropeways technology, one in the gas technology and four fatalities in the electrical technology:

- Two fatalities (one in passenger ropeways technology and the other in the boiler, pressure vessel and refrigeration technology) remain under investigation.
- Gas: One fatality was caused by carbon monoxide poisoning in a mobile home.
- Electrical: In two separate incidents, the cause could not be determined due to the extensive fire damage to the site.
- Electrical: In one incident, a fire occurred as a result of im properly using electrical equipment over an extended period of time.
- Electrical: In one incident, a worker was electrocuted when doing electrical work.

Fatalities have a profound emotional impact on all involved. We are committed to assisting other authorities in their investigations into the circumstances of a death to prevent future deaths in similar situations.[2]

[1]Injury assessments are reported to the BC Safety Authority and specific details may not be available or are not provided.
[2]The facts of all sudden or unexpected deaths must be ascertained and clarified by the BC Coroner Service to determine how, when, where, and by what means the death occurred. The BC Safety Authority continues to strengthen working relationships with both the Coroner Service and the BC Fire Commissioner's Office to improve our investigation assistance.

Incidents Summary

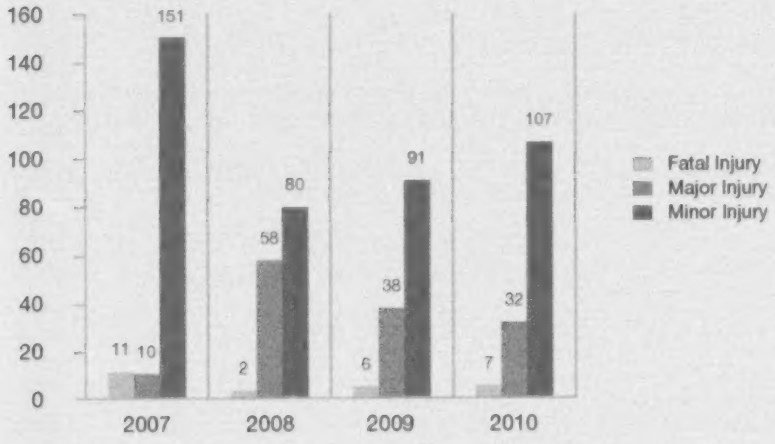
Figure 7: Summary of Injuries Sustained in 2010 by Technology

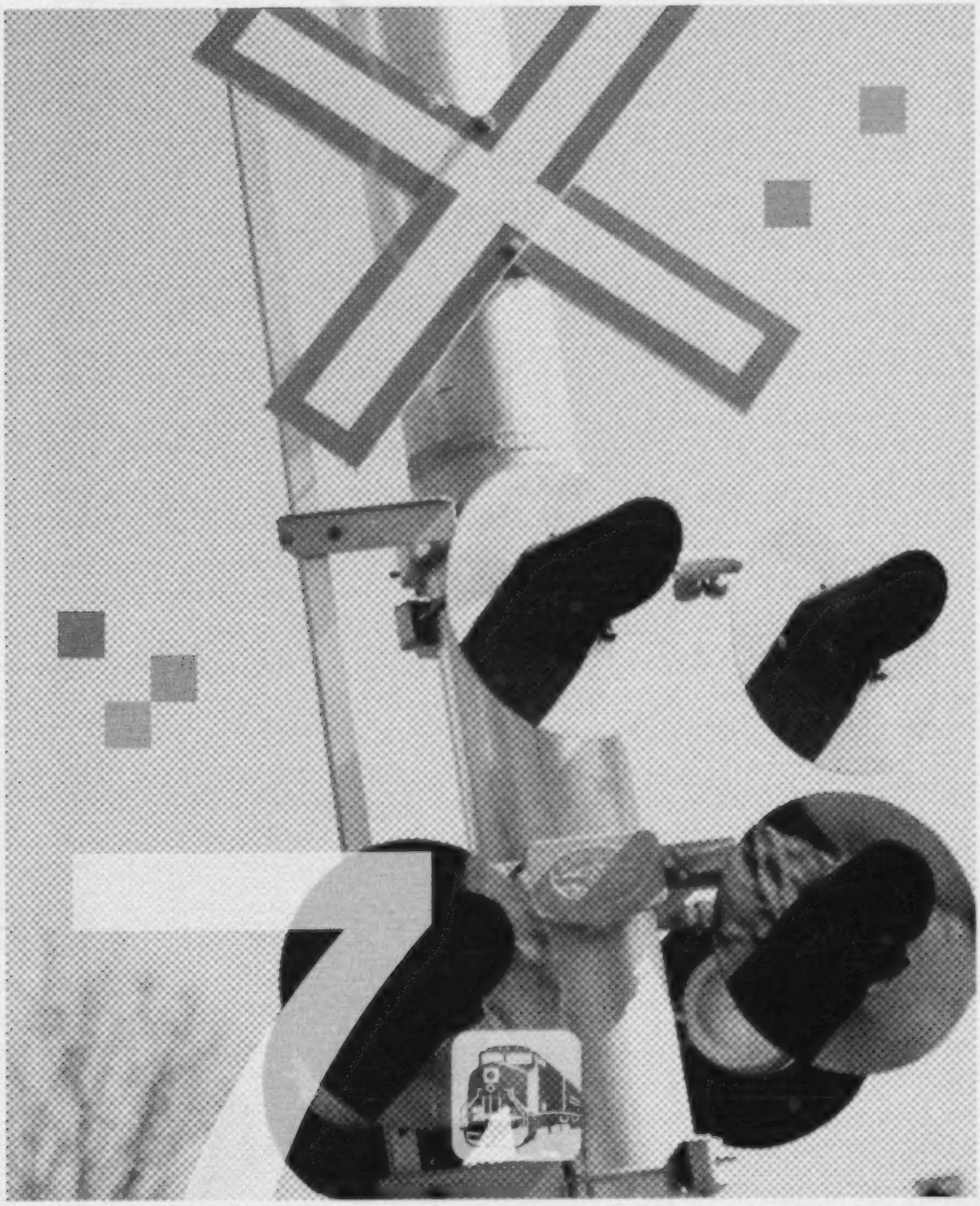
Reported Injuries by Technology

TECHNOLOGY	TYPE OF INJURY REPORTED			
	Minor	Major	Fatality	Total
Amusement Rides	18	1	0	19
Boilers, Pressure Vessels and Refrigeration	6	0	1	7
Electrical	17	3	4	24
Elevating Devices	22	1	0	23
Gas	9	12	1	22
Passenger Ropeways	35	15	1	51
Railways	*Data not available*			

Figure 8: Incident Notifications Involving Injury 2007-2010

Injuries Sustained from Incidents 2007-2010





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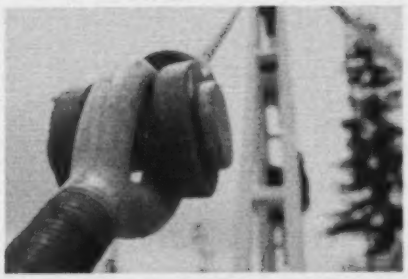
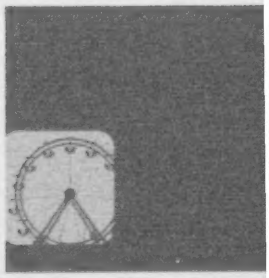
Technology Reports

Amusement Rides





At the BC Safety Authority we oversee the safety of amusement ride installation and operation in accordance with the *Safety Standards Act* and the *Elevating Devices Safety Regulation.*

In the Amusement Rides Safety Program at the BC Safety Authority, we oversee the safety of amusement ride installation and operation in accordance with the *Safety Standards Act* and the *Elevating Devices Safety Regulation.* The types of regulated amusement rides range from small, single flume waterslides in hotels and inflatable play equipment to large major rides such as roller coasters operating at the Pacific National Exhibition. Small train rides such as the Stanley Park Train are also included within the amusement ride technology.

Summary

Inspection and education continue to be a strong component in the Amusement Rides Safety Program. Safety officers continue working with contractors to help enhance their internal safety systems through education efforts. As more data is gathered through inspection practices, the analysis of the data will assist this technology in its research efforts required to develop a more risk based approach to inspection.

A number of enforcement actions were taken against contractors performing unpermitted work and creating unsafe conditions that caused incidents with a potential to cause serious injury. This effort will continue to level the playing field in this technology so that a shift to a more risk-based approach to the inspection of amusement rides and devices can be developed across all sectors of this technology.

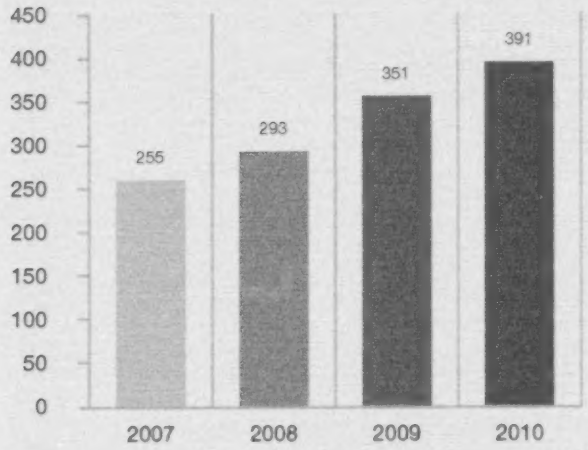
A final draft Canadian Source document for the harmonization of Canadian and American amusement device standards was voted on by the American Society for Testing and Materials voting membership. However, negative votes requiring resolution prevented the document from being finalized. All of the negative votes were successfully dealt with and a new document will be put forward for a vote in 2011.

Jason Gill
Amusement Rides and Passenger Ropeways Safety Manager

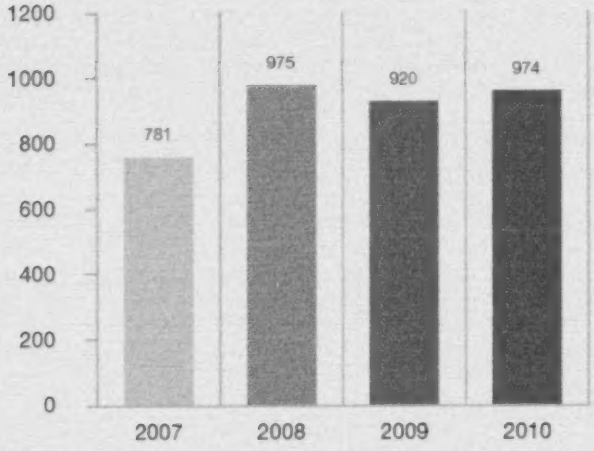
Amusement Rides

Inspection Activity in 2010

AR.1 Amusement Rides: Inspections Performed 2007-2010



AR.2 Amusement Rides: Non-Compliances Found on Inspection 2007-2010



Amusement rides safety officers conducted 391 inspections in 2010, an 11% increase over the previous year. This was mostly a result of the registration of more amusement rides, which had increased to 417 in 2010 from 386 in 2009. In addition to inspection activities, safety officers continued to assist the amusement ride industry in the registration of rides. An 8% increase of registered amusement devices in 2010 was mostly attributed to the registration of inflatable amusement devices as a result of increased efforts to identify unlicensed contractors and unpermitted devices.

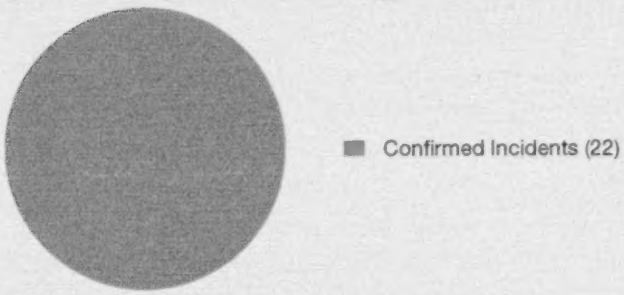
We engaged in discussions with the Whistler Sports Legacies Society regarding their intention to operate the Whistler Sliding Center for public use. The Whistler Sliding Center intends to offer public bobsleigh and skeleton rides, which fall under the definition of an amusement device in the *Elevating Devices Safety Regulation*. We are working with the Whistler Sports Legacies Society to ensure that a rigorous analysis is undertaken to determine that the operation is safe for public use. It is anticipated that the sliding center will open for the public in 2011 once all analysis and required acceptance inspections and assessments are completed.

Amusement Rides

Inspection Activity in 2010

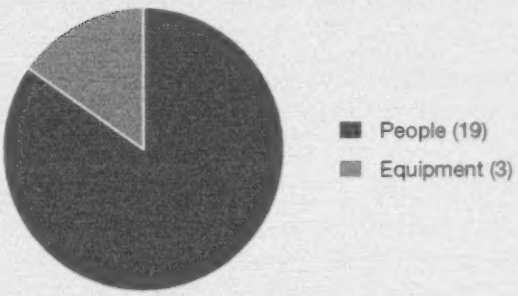
AR.3 Amusement Rides: Investigation Outcome of Reported Cases

Total Number of Reported Cases: 22



AR.4 Amusement Rides: Incidents by Identified Cause

Number of Confirmed Cases: 22



In 2009, there were twenty-two amusement ride incidents reported to us. One individual sustained serious injury and 18 others sustained minor injuries. The one serious injury took place on an alpine slide device[1] where the rider dislocated a shoulder. An incident investigation attributed the injury to inappropriate rider behavior due to failure to reduce speed on a corner and not adhering to instructions on posted signage.

Of the twenty-two incidents reported, rider error was the cause of twelve, and two were attributed to incorrect installation of a travelling amusement ride. In two of the reported incidents, passengers were struck by amusement ride seats on a swing ride due to the fact that the ride was not setup with the correct clearance envelope to an adjacent amusement ride. Both of these incidents occurred on the same swing ride and upon further investigation, enforcement actions were taken against the contractor.

An incident occurred on a train ride where the operator of the train was exposed to carbon monoxide because of a faulty engine exhaust system. The operator was treated at hospital for exposure to carbon monoxide.

Safety officers also investigated an incident where a four-year-old boy fell into the center of a circular kiddie car ride[2] after the child stood up during the ride cycle and received serious lacerations to his forehead and scrapes to his chest. The investigation determined that the contractor failed to install seat belts on the ride, and that this non-compliance was recorded on a prior inspection. The investigation resulted in the Provincial Safety Manager imposing a monetary penalty to the owner for failing to resolve out-standing non-compliances which contributed to the incident.

[1] An alpine slide device is a flume ride where riders are in a directional flume on wheeled carts that have braking capabilities.
[2] A "kiddie ride" is an amusement ride designed primarily for use by children up to twelve years of age.

Amusement Rides

Improving Public Safety

Our ongoing effort to educate contractors on national code requirements is an essential component of the safety system. Safety officers assisted contractors in the development of training programs for amusement ride operators to ensure that all operating requirements are addressed and that training is properly documented.

In 2010, it was decided that an amusement device technology advisory committee would be established. This committee, consisting of amusement device stakeholders and the Provincial Safety Manager, will focus on amusement device safety issues to achieve better alignment with industry's needs.

Industry & Technology Engagement

In the Amusement Rides Safety Program, we worked with the following organizations and committees in 2010:

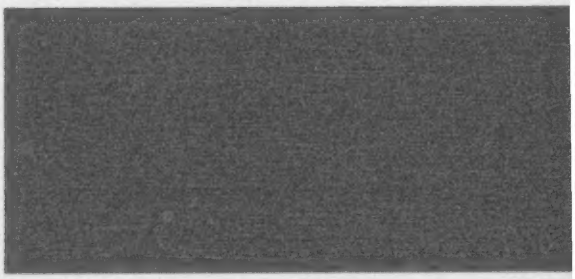
- Stakeholder Engagement
  - Passenger Ropeways and Amusement Rides Technology Advisory Committee
- Industry Associations
  - National Association of Amusement Ride Safety Officials
  - Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games
- National Codes and Standards Committees
  - Canadian Standards Association CSA 267 Amusement Device Code
  - American Standards for Testing and Materials F24 Committee

Future Outlook and Trends

We are expecting growth in the zipline sector of the amusement device technology. Increased interest in this sector can be attributed to the very popular zipline that was constructed in downtown Vancouver as part of the 2010 Olympic and Paralympic Winter Games' celebration. The popularity of the temporary installation generated many requests from companies interested in tourism businesses that utilize ziplines.

A major fixed ride amusement park in British Columbia has announced a new master development plan that will increase the useable acreage of the park. We anticipate that this amusement park's development plan will result in the installation of several more fixed park rides at this location. ■

Boilers, Pressure Vessels & Refrigeration



BC Safety Authority oversees the construction, installation, and operation of boilers, pressure vessels and refrigeration plants in accordance with the *Safety Standards Act* and the *Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation.*

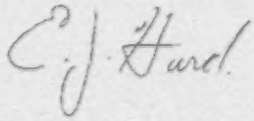
In the Boiler and Pressure Vessel Safety Program at the BC Safety Authority, we oversee the construction, installation, and operation of boilers, pressure vessels and refrigeration plants in accordance with the *Safety Standards Act* and the *Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation*. In addition to promoting the safe operation of this equipment, we review new boiler and pressure vessel designs prior to construction to ensure compliance with safety code requirements. In the Boiler and Pressure Vessel Safety Program, we also administer the licensing of contractors and certification of power engineers.

Summary

In 2010, the activities of the Boilers, Pressure Vessels and Refrigeration Safety Program concentrated on the inspection of higher risk installations, education to increase incident reporting, and special status plant registration of arenas and ice rinks to ensure they operate in conformance with the *Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation*.

We also completed two initiatives to support the implementation of biofuel technology in British Columbia. In collaboration with TUV Austria, we developed a process to approve biomass boilers conforming to European standards and worked to revise the regulations in place to eliminate prescribed staffing requirements for low pressure thermal fluid plants with an approved automated control system.

As we move into 2011, the Boilers, Pressure Vessels and Refrigeration Safety Program will continue to work on policies which will promote the adoption in British Columbia of global developments in areas of green energy technology such as biofuels.

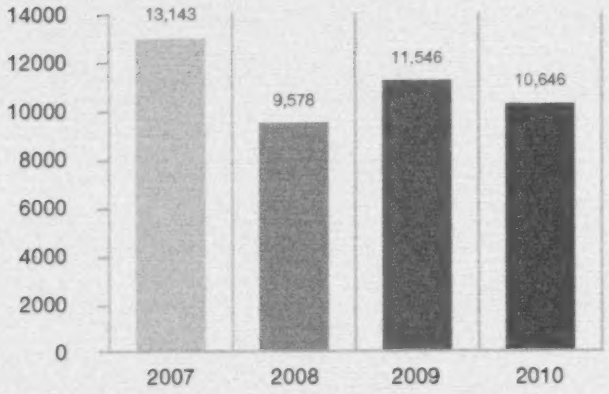


Ed Hurd, P.Eng.
Boilers, Pressure Vessels and Refrigeration Safety Manager

Boilers, Pressure Vessels & Refrigeration

Inspection Activity

B.1 Boiler, Pressure Vessel & Refrigeration: Inspections Performed 2007-2010



Annual operating permits increased to almost 60,000 compared to 58,000 in 2009. Boiler safety officers performed more than 10,600 inspections, which is an 8% decrease compared to 2009. This decrease was due in part to vacant safety officer positions in several areas of British Columbia.

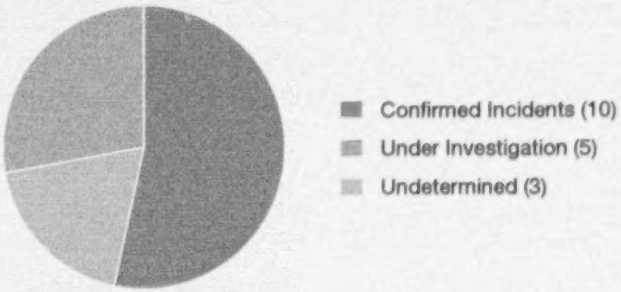
The Boilers, Pressure Vessels and Refrigeration Safety Program continued to shift toward a risk-based focus on safety, using a risk assessment program to target the highest risk installations for inspection and also carry out audits to increase special plant registrations ('Risk Assessed' or 'General Supervision' statuses).

Boilers, Pressure Vessels & Refrigeration

Incidents in 2010

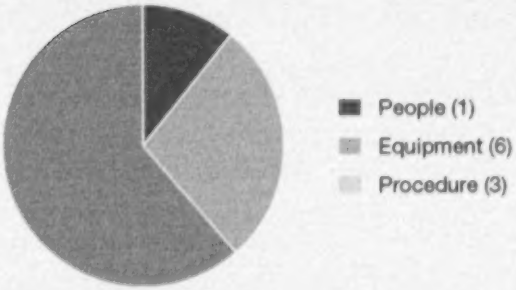
B.2 Boiler, Pressure Vessel & Refrigeration: Investigation Outcome of Reported Cases

Total Number of Reported Cases: 18



B.3 Boiler, Pressure Vessel & Refrigeration: Incidents by Identified Cause

Number of Confirmed Cases: 10



Eighteen incidents involving boilers, pressure vessels, pressure piping or refrigeration systems were reported in 2010. This is a 61% increase over the seven incidents reported in 2009. Rather than indicating a negative safety pattern, this increase was considered to be a result of an improved education effort to make equipment owners and operators aware of their responsibility under the regulations to report all incidents. The increase in incidents during 2010 reflects the improvement of the reporting process from internal and external clients as well as an increase in the awareness about the safety hazards.

There was one fatality and six injuries resulting from the 18 reported incidents. Two of the injuries were major injuries while the other injuries were minor. Of the 18 reported incidents, there were ten incidents in which regulated equipment was confirmed to be directly related to the incident. Six incidents were attributed to equipment failure, three were found to be related to incorrect operating procedure and one was due to a lack of operator knowledge.

The incident resulting in fatal injuries occurred during the commissioning of a plant. This incident remains under investigation by WorkSafeBC and the BC Safety Authority. The cause and role of regulated equipment in the incident has yet to be determined.

Major injuries were reported in two incidents. A worker sustained burns when hot condensate water was sprayed when the condensate pump's expansion joint failed. In another incident a worker suffered broken bones and other injuries when the supports of a water storage tank collapsed. The concrete floor slab on which the tank supports were installed was undermined during excavations for drain repairs and when the soil under the slab was removed it could not support the loads imposed by the legs of the tank support frame. The collapsing tank and supports struck the worker carrying out the drain repairs.

There were seven reported safety incidents for refrigeration systems. Six of these incidents involved ammonia leaks or accidental releases and three of these refrigeration incidents required precautionary evacuation of buildings due to the toxicity of the refrigerant released. To address the incidents with refrigeration systems, the Boilers, Pressure Vessels and Refrigeration Safety Program prioritized audits for special plant registrations (plants classified as 'Risk Assessed' or 'General Supervision').

Boilers, Pressure Vessels & Refrigeration

Improving Public Safety

Prior to March 2010, the *Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation* restricted the qualifications for boiler safety officers to a First Class Power Engineer Certification (or those who would shortly become First Class Power Engineers). This restriction created inefficiencies in hiring and led to discrepancies with hiring practices in other Canadian jurisdictions. There are many other engineering professions, technical accreditations and training that provide the knowledge and necessary experience to carry out the duties of a boiler safety officer.

The regulation was revised so that applicants for positions as boiler safety officers must either hold a valid National Board[10] Commission as a boiler and pressure vessel inspector or meet the qualification criteria for obtaining that commission. The newly expanded criteria ensures that appropriately qualified people are performing the duties of safety officers while establishing a team with diverse skill set that will assist us to move forward with innovative programs.

Traditionally, British Columbia has required foreign manufacturers be accredited by the American Society of Mechanical Engineers (ASME) prior to importing boilers into the province. The ASME standards for construction are used across North America as the basis for boiler and pressure vessel design and manufacture. The ASME accredits manufacturing shops that have satisfactory quality control systems to ensure safe design and construction.

In 2010, BC Safety Authority staff traveled to Austria to gain an understanding of the European Pressure Equipment Directive, a non-ASME process for ensuring safe boiler design and manufacture.

In collaboration with TUV Austria Services, we have developed a process to approve biomass boilers conforming to the essential safety requirements of the EC Directives[11] and European standards. European manufacturers may utilize a notified body or accredited inspection body, acceptable to the BC Safety Authority, to verify that a boiler satisfies specified requirements of the EC Directives and European standards, and have these boilers registered for use in British Columbia. This change will allow green bioenergy projects to utilize the reliable and innovative technologies developed over the past 30 years in Europe.

Low pressure thermal fluid plants utilize thermal fluids such as mineral oils, synthetic or organic-based oils for heat transfer to provide heat for industrial purposes (e.g., wood kilns), or can be adapted to provide a heat source for community heating system projects which provide building heat or hot water. These plants with a heating surface area over 150 square metres require prescribed staffing by appropriately certified power engineers. Under an amendment to the *Power Engineers, Boilers, Pressure Vessels and Refrigeration Safety Regulation* made in March 2010, low pressure thermal fluid plants that are equipped with advanced automated control systems that are fail-safe and have been approved by a professional engineer are exempt from prescribed staffing by power engineers. In order to qualify for the exemption, owners of low pressure thermal fluid plants must comply with the requirements of the *Power Engineers, Boilers, Pressure Vessels and Refrigeration Safety Regulation* and must have their automated control system registered with a provincial safety manager. This change will lower the operating costs for plant owners while maintaining a high level of safety.

[10]The National Board of Boiler and Pressure Vessel Inspectors was created to promote greater safety to life and property through uniformity in the construction installation, repair, maintenance and inspection of pressure equipment. The membership oversees adherence to laws, rules and regulations relating to boilers and pressure vessels. The National Board members are the chief boiler inspectors representing most states and all provinces of North America.

[11]An EC Directive is a legislative act of the European Union which requires member states to achieve a particular result without dictating the means or process of achieving that result.

Boilers, Pressure Vessels & Refrigeration

Industry & Technology Engagement

In the Boilers, Pressure Vessels and Refrigeration Safety Program, we worked with the following organizations and committees in 2010:

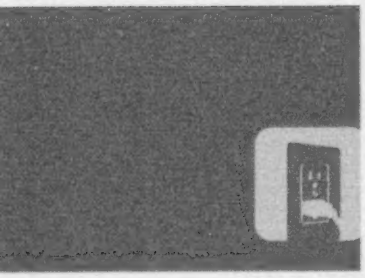
- Stakeholder Engagement
  - Boiler Technology Advisory Committee
  - Risk Reduction Working Group on Mandatory Maintenance on low pressure vessels less than 30m³
- Industry Associations
  - BC Bioenergy Network
  - Building Owners and Managers Association
  - Canadian Bioenergy Association
  - Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games
- National Codes and Standards Committees
  - American Society of Mechanical Engineers
  - Association of Chief Inspectors Technical Committee
  - Canadian Standards Associations Technical Committee
  - National Board of Boiler & Pressure Vessel Inspectors
  - National Public Safety Advisory Committee
  - Standardization of Power Engineer Examinations Committee

Future Outlook and Trends

In response to stakeholder concerns regarding the prescriptive nature of many regulations and the lack of opportunity to use a performance-based approach to safety management, the *Safety Standards Act* was amended to incorporate requirements for Alternative Safety Approaches in 2011[12]. With these changes, stakeholders will be able to streamline the approval of new and innovative technologies and implement best practices for managing safety.

The initial candidates for Alternative Safety Approaches will be bioenergy sector proponents and the Boilers, Pressure Vessels and Refrigeration Safety Program is expected to be one of the primary technologies encompassed at the outset as exemplar Alternative Safety Approaches are developed in 2011. The Alternative Safety Approaches will eliminate barriers to allow bioenergy projects to utilize the most recent developments world wide, enabling and promoting green energy in support of the Government of BC's Energy Plan and its Vision for Clean Energy Leadership. ■

[12] More information about Alternative Safety Approaches can be accessed in the BC Safety Authority's *2010 Annual Report on Safety Regulations*.



Electrical

At the BC Safety Authority we oversee the safety of electrical systems across British Columbia through the administration of the *Safety Standards Act* and the *Electrical Safety Regulation.*

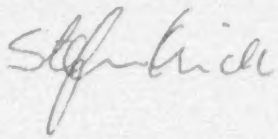
In the Electrical Safety Program at the BC Safety Authority, we oversee the safety of electrical systems across British Columbia through the administration of the *Safety Standards Act* and the *Electrical Safety Regulation*. We are responsible for delivering electrical safety services for approximately 50% of the provincial permitting activity. Burnaby, Maple Ridge, North Vancouver (City and District), Surrey, Vancouver, Victoria, and West Vancouver provide electrical safety services in their municipalities. The electrical safety services we deliver cover all types of electrical installations in residential, commercial, and industrial sites.

Summary

The education program continues to grow and improve. These programs are a key part of our proactive safety strategy and were expanded in 2010. Several new education programs were developed in 2010 for the electrical contracting community. These programs provide information on the safe installation of electrical equipment and the topics included patient care areas and primary overhead line construction.

Inspection remained an important component in 2010, as we continued to focus on higher-risk activities such as high-voltage installations. Similarly to 2009, a decrease in permit activity in 2010 led to a corresponding decrease in inspection activity.

As in previous years, fires were the majority of incidents investigated. In many cases, electrical equipment was either ruled out as the cause of the fire, or the damage was too extensive to determine a definite cause. Injuries to workers due to inadequate safety procedures were also noted in many incidents, and we continue to provide education on safe electrical work practices to electrical contractors. Work also continues to be done, in conjunction with training institutions, to deliver similar information around safe work practices to electrical apprentices.

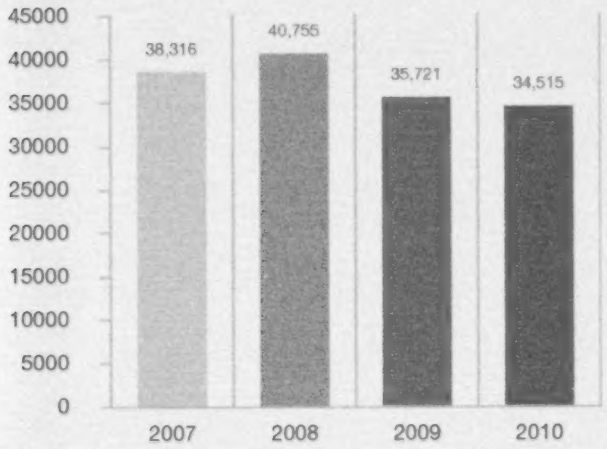


Stephen Hinde, P.Eng.
Electrical Safety Manager

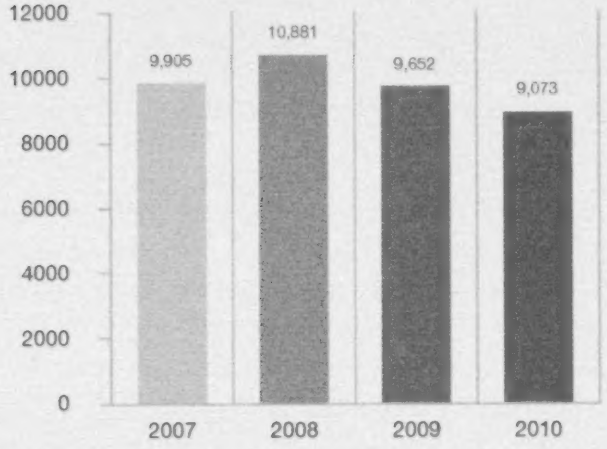
Electrical

Inspection Activity

EL.1 Electrical:
Inspections Performed 2007-2010



EL.1 Electrical: Non-Compliances Found
on Inspection 2007-2010

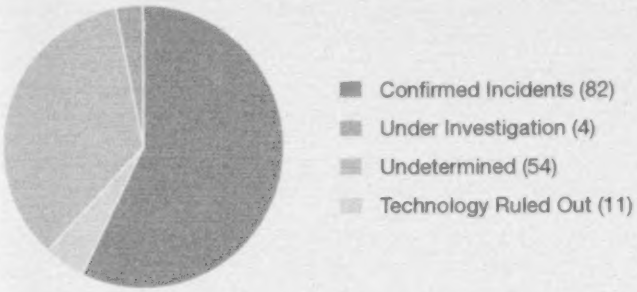


In 2010, we issued more than 69,000 electrical installation permits. From these issued permits, our safety officers identified and inspected over 34,500 installations. This was a 3% decrease from 2009 figures, which is attributed to the increased focus on higher risk activities and the resulting increased complexity associated with those activities. Analysis of "as-found conditions" reported by the safety officers in inspection reports showed a slight upwards shift in the rate of compliance for permitted work. Specifically, the as-found conditions show a 74% compliance rate on installation permits.

Incidents in 2010

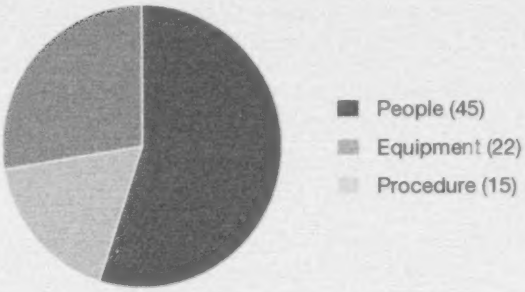
EL.3 Electrical: Investigation Outcome of Reported Cases

Total Number of Reported Cases: 151



EL.4 Electrical: Incidents by Identified Cause

Number of Confirmed Cases: 82



Programs aimed at increased awareness on reporting of incidents resulted in a 12% increase in the number of incidents reported to us over the previous year. In 2010, 151 incidents that potentially involved electrical equipment were reported. Our investigations ruled out the involvement of electrical equipment in 11 of the reported incidents.

Incident investigations were able to confirm electrical involvement in 82 cases. The primary cause in most cases was due to human behaviour: people improperly using equipment; using electrical devices for unintended purposes; or not maintaining equipment in good operating condition. Many of these accidents occurred because people were unaware of proper operating, maintenance, or safety precautions.

There were two incidents involving the electrical technology that resulted in fatalities. One incident involved a faulty electrical extension cord and resulted in a fatal injury to one person and major injuries to one other person. In the other incident, which was investigated jointly with WorkSafeBC, the circumstances that led to a fatal electrical shock to an electrical worker, who had been working on 240 volt equipment, could not be recreated.

Two additional incidents resulted in fatalities; however, due to the extensive damage to the premise and equipment, the cause of the incident could not be determined.

Investigations of six arc-flash[1] incidents resulted in burns to four electrical workers at three of these incidents. Occupational health and safety procedures were not followed in each of these incidents.

[1] Arc-flash is a violent explosion caused by the extreme heat in electrical components from a short circuit condition.

Electrical

Residential Electrical Fires in British Columbia

Fire-related incidents account for the majority of the total incidents investigated by electrical safety officers. In 2010, approximately 61% of incidents reported to us involved residences (total 92 incidents), in which 84 incidents were related to fires. Investigations of these incidents concluded electrical involvement in 43 incidents. Damage to service conductors was identified as having caused residential house fires in ten incidents. Many of these fires occurred due to lack of attention to proper procedures during activities such as renovations.

Extension cords, power bars, and equipment cords were identified as having caused six fires. These incidents resulted from damaged cords and misuse of extension cords. Misuse of an extension cord was also suspected in one incident, where the fire damage had been too severe to make a positive determination.

Incident investigators were able to exclude electrical involvement as an ignition source in only seven investigations. Investigators were unable to determine the causes in 34 of these incidents, due to the destruction of evidence during the fire.

Our analysis confirms one of the risks faced by the electrical technology; it reinforces the need to change user behaviours. Incorrect installation, lack of maintenance, and the improper use of appliances continue to be primary causes of electrical fires. We will share this analysis with other jurisdictions. As well, we will use this research to prioritize both outreach efforts and our inspection processes.

Improving Public Safety

We worked throughout 2009 and 2010 with service providers to the 2010 Olympic and Paralympic Winter Games. This international event drew equipment and workers from the around the world, and it was important to ensure that the equipment owners were aware of British Columbia's safety standards and that the installations met these requirements. Most facilities for this event were built by licensed contractors under permit, and were inspected for code compliance.

Industry & Technology Engagement

In the Electrical Safety Program, we worked with the following organizations and committees in 2010:

- Stakeholder Engagement
  - Electrical Technology Advisory Committee
  - Risk Reduction Working Group on Review of the *Electrical Safety Regulation* Section 18 and CSA Z462
  - Risk Reduction Working Group on Dairy Farm Voltage
- Industry Associations
  - BC Electrical Association
  - British Columbia Real Estate Association
  - Electrical Contractors Association of BC
  - Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games
- National Codes and Standards Committees
  - Canadian Advisory Committee on Electrical Safety – Canadian Standards Association Part 1

Future Outlook and Trends

The volume of installation permits is expected to increase in 2011, particularly in the residential sector, as the province moves out of a recessionary period. The importation of counterfeit and unapproved electrical products, a trend identified in 2009, remains a concern. This is a global issue and we will continue to work with other authorities and certification agencies to control the use of these potentially unsafe products.

For 2011, we are reviewing the policies and procedures pertaining to operating permits to ensure appropriate risk assessments are performed on operating permits so that risk-mitigating strategies can be developed and implemented.

Field Safety Representatives are qualified individuals that responsible for ensuring all regulated electrical work is completed in accordance with all applicable codes and regulations. The Field Safety Representative qualification is issued to qualified individuals without an expiry date and without requirements to demonstrate ongoing technical knowledge. We are exploring options to introduce a renewal process that would allow us to monitor both the individuals performing regulated work and also ensuring these individuals maintain current knowledge of codes and regulations. ■

Elevating Devices

BC Safety Authority is responsible for overseeing the safety of elevators, escalators, moving walkways, dumbwaiters, lifts, and construction hoists in accordance with the *Safety Standards Act* and the *Elevating Devices Safety Regulation*.

In the Elevating Devices Safety Program at the BC Safety Authority, we are responsible for overseeing the safety of elevators, escalators, moving walkways, dumbwaiters, lifts, and construction hoists in accordance with the *Safety Standards Act* and the *Elevating Devices Safety Regulation*.

Summary

In 2010, inspection of operating permits was the primary activity for the Elevating Devices Safety Program. From the assessment findings, we issued a directive to address owner/property manager awareness in the area of mandatory maintenance requirements of an elevating device. From a compliance monitoring perspective, we also instituted a system of periodic declarations where the contractors are required to submit completed code examinations and testing to the BC Safety Authority for random audit.

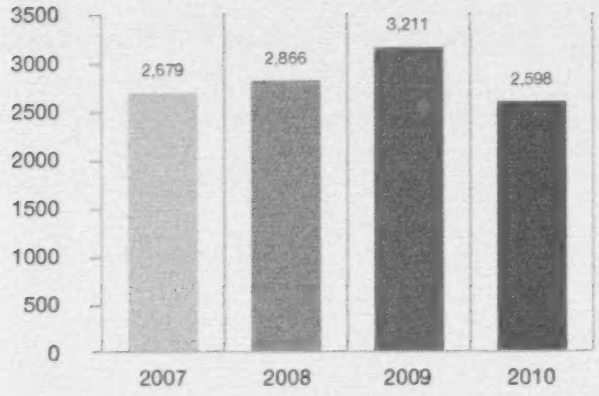
The number of reported incidents to the BC Safety Authority was 34, which was more than in 2009. The data from our inspections, along with the type of incidents reported to BC Safety Authority, is used to issue relevant safety orders, directives and information bulletins. Enforcement was also a primary focus. In 2010, the Safety Manager issued monetary penalties to contractors where they had failed to comply with a safety order.

The 2007 edition of the Safety Code for Elevators and Escalators was adopted in 2010, and with this adoption hydraulic elevators with single bottom cylinders were mandated to be retrofitted. A safety order was issued to owners/property managers outlining their obligations to address this issue within five years.

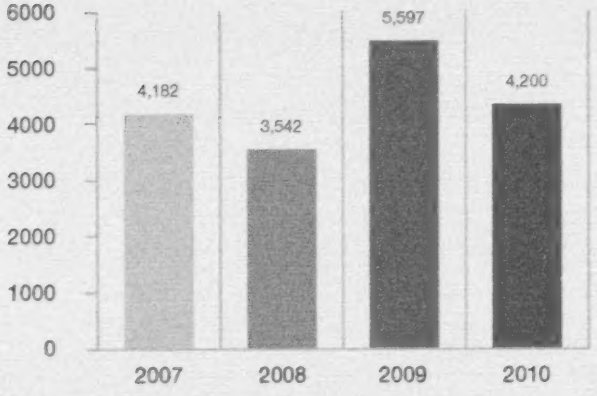
Janice Lee, P.Eng
Elevating Devices Safety Manager

Inspection Activity

ED.1 Elevating Devices: Inspections Performed 2007-2010



ED.2 Elevating Devices: Non-Compliances Found on Inspection 2007-2010



Overall inspections decreased due to the decline in new installations of elevating devices. Assessment of operating or in-service units was the continued focus of elevating devices safety officers. More than 35% of all inspections performed were on existing elevators, and focused on the higher-risk occupancy buildings such as hospitals.

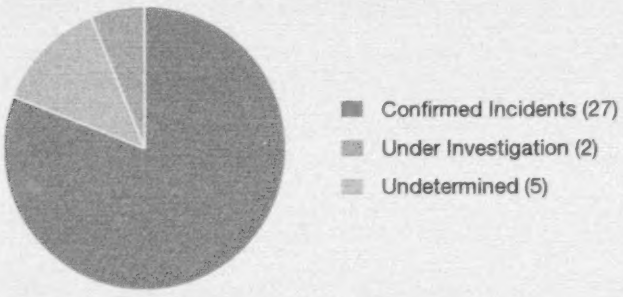
From the assessment of operating units, we found that mandatory maintenance requirements as required by regulation were inconsistently performed due to lack of owner awareness and contractor compliance. As a result, to address owner education we issued a directive to clarify mandatory maintenance, which included outlining maintenance requirements, maintenance frequency, a "Frequency Asked Questions" section, relevant code, and regulation. To address contractor compliance, we required contractors to submit periodic declarations to us. Periodic declarations are forms that stipulate the code required examinations and testing that must be performed on the specific elevating device. These periodic declarations are used for the purpose of compliance monitoring of contractors and are randomly audited by safety officers which drives their next inspection visit. On the Annual Operating Permit, owners are notified should a periodic declaration be overdue so that they can monitor the performance of their elevator contractor. In addition, education sessions for owners and property managers will continue into 2011 to inform them of their regulatory requirements.

Elevating Devices

Incidents in 2010

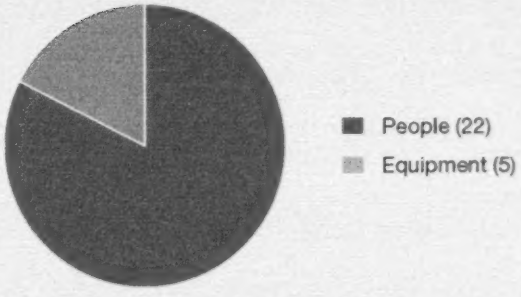
ED.3 Elevating Devices: Investigation Outcome of Reported Cases

Total Number of Reported Cases: 34



ED.4 Elevating Devices: Incidents by Identified Cause

Number of Confirmed Incidents: 27



Improving Public Safety

Following extensive analyses in 2009, the BC Safety Authority recommended the adoption of the 2007 edition of the Safety Code for Elevators and Escalators. In the process of adopting the 2007 edition, British Columbia became the first Canadian jurisdiction to require the mandatory retrofitting of older hydraulic elevators known as "single bottom cylinder" elevators. Those elevators were nearing the end of their engineered life and there have been several incidents around North America where the hydraulic cylinder has failed resulting in a sudden drop of the elevator car. Research into the susceptibility of these types of elevators in active seismic zones further indicated that these devices required one of three available retrofitting safety solutions. A safety order and an information bulletin were issued mandating the retrofit of all hydraulic elevators with single bottom cylinders by October 8, 2015. Education on this issue was delivered through presentation seminars and publishing newsletters with numerous owner and property management associations and will continue into 2011.

In 2009, we issued a Safety Order which addressed the annual maintenance requirements of all driving machine brakes on electric elevators. Six elevator contractors failed to comply with the Safety Order and as a result they were issued Monetary Penalties in 2010 to modify the behaviours of contractors and to improve public safety.

Industry & Technology Engagement

In the Elevating Devices Safety Program, we worked with the following organizations and committees in 2009:

- Stakeholder Engagement
  - Elevating Devices Technology Advisory Committee
- Industry Associations
  - BC Apartment Owners and Managers Association
  - BC Hotel Association
  - BC Housing
  - BC Non-Profit Housing Association
  - Building Owners and Managers Association of BC
  - Condominium Home Owners Association
  - Health Authorities
  - Rental Owners and Managers Society of BC
  - Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games

- National Codes and Standards Committees
  - Association of Provincial Chief Elevator Inspectors
  - Advisory Council on Elevating Devices
  - Canadian Standards Association CSA-B44 Elevator Safety Code
  - Canadian Standards Association CSA-B44 Elevator Safety Code Executive Committee
  - Canadian Standards Association CSA-B44/ASME A171 Joint Elevator Safety Code
  - Canadian Standards Association CSA-B44/ASME A17.5 Elevator & Escalator Electrical Equipment Code
  - Canadian Standards Association CSA-B311 Manlifts Safety Code
  - Canadian Standards Association CSA-B355 Lifts for Persons with Physical Disabilities Safety Code
  - Canadian Standards Association CSA-Z256 (R2001) Safety Code for Construction Hoists
  - Canadian Standards Association CSA-Z185 (Construction) Personnel Hoists Safety Code

Future Outlook and Trends

At present, there are no uniform standards for the certification of approximately 1000 people working as elevating devices mechanics in British Columbia. There have been a number of incidents involving elevating devices mechanics over the past several years including a fatality. In order to address this problem and to implement one of the findings in the Coroner's Report concerning the fatality mentioned above, we are in the process of developing a mechanic certification program that will establish uniform standards for elevating devices mechanics and implement a mechanism for assessing their competency on an on-going basis.

In 2010, we led the development of standards for education with direct support from the elevating industry under the guidance and facilitation of the British Columbia Institute of Technology. The outcomes of five separate workshops held with industry participants were four standards for education, also known as program outlines; one standard for each class of elevating devices mechanic we are planning to rollout in 2012. The participation by a diverse cross-section of industry will benefit the whole industry and bring a higher level of safety. Industry participants demonstrated a shared commitment through their sharing of technical expertise, insight, and professionalism.

In 2011, we will continue to engage industry in the development of standards for on-the-job competency achievement. Broader consultations and targeted educational sessions will also be held with industry to bring greater understanding and clarity to the overall program.

A Risk Reduction Working Group was established in 2010 to review and discuss the changes in the 2007 edition of the Safety Code for Elevators and Escalators that pertain to building/elevator emergency services and to identify issues that need to be addressed for successful implementation. The members of this Working Group included a Provincial Building Code representative, City of Vancouver, Fire Chief's representative, elevator contractor/manufacturer, building code consultant, electrical engineer, fire alarm manufacturer and BC Safety Authority. The outcome would be the publishing of a guideline for architects, engineers, building code consultants, elevator contractors and fire fighters where a common understanding of these new requirements can be communicated to stakeholders and so enforcement can also take place with consistency. Work is currently underway and it is anticipated that the guideline will be published in 2011. ■

Gas

At the BC Safety Authority we provide gas safety oversight to all industrial and commercial users of natural gas, propane, digester gas, landfill gas and hydrogen through British Columbia.

In the Gas Safety Program at the BC Safety Authority, we provide gas safety oversight to all industrial and commercial users of natural gas, propane, digester gas, landfill gas and hydrogen throughout British Columbia. In accordance with the *Safety Standards Act* and the *Gas Safety Regulation*, we provide gas safety services for nearly 1.2 million homes. This figure excludes homes in Burnaby, Kelowna, North Vancouver (City and District), Richmond, Vancouver and Maple Ridge, where services are provided by local governments.

Summary

As in previous years, human behaviour attributed to the majority of incidents that occurred in 2010. In these types of incidents, the users and operators of gas-fuelled appliances were either inattentive or unaware of the safe use of these appliances. During 2010, we proceeded with initiatives in the Gas Safety Program that intended to reduce the number of incidents.

One of our initiatives was the continued refinement of the risk-based approach toward gas safety oversight. We focused our efforts on the higher safety risks identified through this approach. We also improved this approach by incorporating an additional risk factor to more accurately assess the risk for each installation.

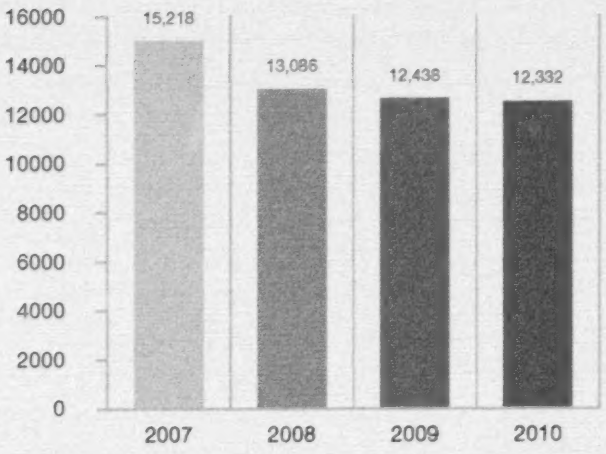
In another initiative, we completed a study of incidents that resulted in fatalities caused by carbon monoxide poisoning related to the use of propane-fuelled equipment. Our goal for 2011 is to create a multi-year safety awareness campaign about carbon monoxide safety. We intend to reach the groups that are at most risk to exposure to carbon monoxide hazards.

Further to these initiatives, in 2011, we will continue our education and outreach efforts to the gas industry and the public. The integrated use of inspection, assessment, and enforcement will also support our goal of the prevention of accidents.

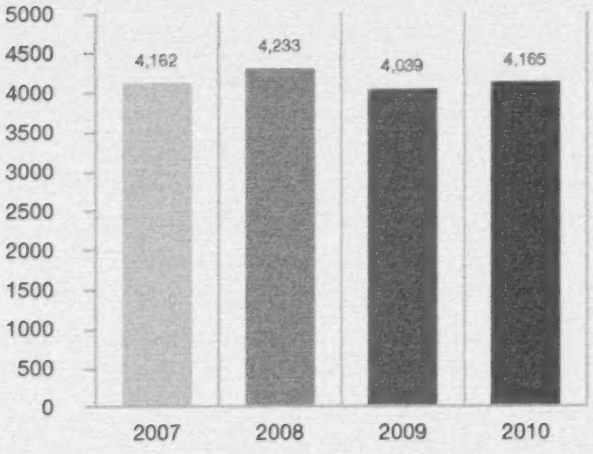
Wayne Lock
Gas Safety Manager

Inspection Activity

G.1 Gas: Inspections Performed 2007-2010



G.2 Gas: Non-Compliances Found on Inspection 2007-2010



Gas safety officers conduct risk assessments of permits to prioritize their inspection activity. Most of the installations by contractors tend to be low-risk and do not pose significant hazards to the public. Only one percent of the more than 37,000 installations were in the higher-risk range.

With the use of a risk assessment tool, safety officers can combine all the risk factors associated with a permit into a single score. A low-risk level score would relate to a good-performing gas fitter, the type of work or equipment, and whether a safety officer recently inspected the work of the gas fitter. In which case, the safety officer can automatically waive the permits scored at a low-risk level.

The risk assessment tool enables the safety officers to shift their focus on the higher-risk installations. Installation permits assigned higher-risk scores require mandatory inspections. It could also mean a thorough investigation by a safety officer on the installation. In contrast, the safety officer will review a permit with a score in the middle range to determine whether a site inspection is necessary. Otherwise, the safety officer can waive the permit.

We can measure the risk assessment score to past data where the risk posed to the public has been extremely low. In addition, conducting periodic audits on low-risk permits can confirm the validity of the risk assessment tool.

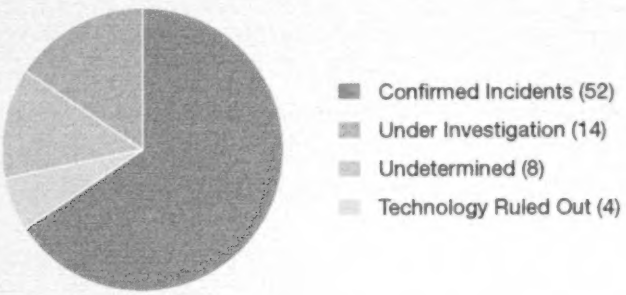
Equivalency

In 2009, the Gas Safety Manager entered into equivalent standards agreements with service providers in preparation to the 2010 Olympic and Paralympic Winter Games. These agreements allowed the service providers operational flexibility in meeting safety requirements. The most notable of the agreements were for the two Olympic Cauldrons as well as the hundreds of temporary gas appliances. The service providers completed the terms of the agreements without incident.

Incidents in 2010

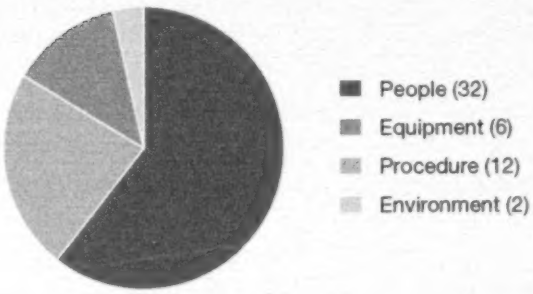
G.3 Gas: Investigation Outcome of Reported Cases

Total Number of Reported Cases: 78



G.4 Gas: Incidents by Identified Cause

Number of Confirmed Cases: 52



During 2010, the Gas Safety Program received 78 incident notifications, of which, 52 related directly to gas equipment or systems. Thirty-two of the 52 indicated the users or operators of the regulated gas equipment or appliances were either inattentive or lacked sufficient knowledge in operating the equipment safely.

In one case, a propane flash occurred during the commissioning of an uncertified and converted gas appliance. This incident resulted in burn injuries to one person. A team of our staff along with WorkSafeBC staff conducted an investigation, which revealed the appliance had been assembled incorrectly. This incident initiated the internal review of our gas product approval processes.

In another incident, carbon monoxide poisoning caused fatal injuries to one occupant of a mobile home, and major injuries to another occupant. An investigation uncovered the incorrect installation of a furnace and gas fireplace. This error caused the flue products containing carbon monoxide to spill into the home instead of venting safely to the atmosphere. With increased awareness of this type of hazard, our efforts are to reduce the number of such incidents in the future.

Improving Public Safety

In April 2010, we held a two-day seminar on the 2010 edition of the CAN/CSA B149 series codes. The Canadian Standards Association led the discussion on the code changes. Provincial and local government safety officers along with utility owners and staff, gas fitters, and gas contractors participated in this well-received seminar. These gas industry professionals learned about the technical developments and updates to the gas code and the effect and impact of the changes to the gas safety system in British Columbia. Some of our staff presented their perspectives on how these code changes would affect the gas industry. The participants expressed further interest in attending future seminars.

We also collaborated with various training organizations to develop a course curriculum for certifying utility locators. The BC Common Ground Alliance facilitated a series of meetings and found an overwhelming consensus that such a curriculum was necessary for the safety of all underground installations. Subsequently, we agreed to continue to support the deployment of the BC Common Ground Alliance's utility locator course. This initiative would help to prevent or reduce damage to underground gas installations as well as other buried utilities.

Industry & Technology Engagement

In the Gas Safety Program, we worked with the following organizations and committees in 2010:

- Stakeholder Engagement
  - Gas Technology Advisory Committee
  - Risk Reduction Working Group on Non-Refillable Propane Cylinders
- Industry Associations
  - BC Common Ground Alliance
  - BC Coroners' Service
  - Canadian Association of Home and Property Inspectors
  - Office of the Fire Commissioner
  - Propane Gas Association of Canada (now Canadian Propane Association)
  - Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games
- National Codes and Standards Committees
  - Interprovincial Gas Advisory Committee
  - Canadian Standards Association CSA B149 Technical Committee and Subcommittees
  - Canadian Standards Association CSA Gas Appliance Technical Committee
  - Canadian Standards Association CSA Joint Technical Committee on Fuel Cell Technologies

Future Outlook and Trends

Beginning in 2009, we had worked with the Office of the Fire Commissioner and the BC Coroners' Service to study the cases of fatal incidents caused by carbon monoxide poisoning related to the use of portable propane-fuelled equipment. The study concluded in 2010, and resulted in a statistical review of these incidents along with recommendations to reduce and prevent similar occurrences.

From the historical data, we were able to create a profile of the people most at risk to injury. We could also determine the probability of similar incidents occurring in the future. In this case, our model predicted a 95 percent chance of one fatality attributed to carbon monoxide poisoning in 2010.

With this prediction model and profile, we can develop an awareness campaign and know where to broaden or focus our scope to address the cause of these incidents. We will continue to promote the safe use of propane, but also share data and form partnerships to raise awareness on carbon monoxide exclusive of its source. ■

Passenger Ropeways

In the Passenger Ropeways Safety Program at the BC Safety Authority, we oversee the safety of the passenger ropeways throughout the province, including tramways, gondolas, chairlifts, rope tows and passenger conveyors.

In the Passenger Ropeways Safety Program at the BC Safety Authority, we oversee the safety of the passenger ropeways throughout the province, including tramways, gondolas, chairlifts, rope tows and passenger conveyors. We inspect new, operating, and modified units in accordance with the *Safety Standards Act* and the *Elevating Devices Safety Regulation*.

Summary

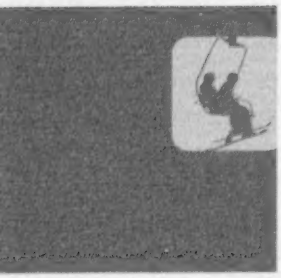
The Passenger Ropeway Safety Program continues to focus its efforts in the inspection and education areas of the operating model. BC Safety Authority reviewed the proposed online delivery of the Lift 150 program at Selkirk College that all persons responsible for passenger ropeway training programs must pass in order to be eligible for the required certificate of qualification.

The research of incidents in the passenger ropeway technology was enhanced this year by participating in the International Meeting of Technical Supervisors in Ropeway Engineering (ITTAB), an annual conference of passenger ropeway regulators. At this conference, incident data is shared and reviewed among the participants so that the learning from these incidents may improve passenger ropeway safety worldwide.

The investigation into the Excalibur Gondola tower failure was completed and published in July of 2010. This exhaustive analysis on the tower failure was made available to industry and the public. Six recommendations were made to prevent this type of failure and these recommendations were distributed to the industry and public through a safety order and information bulletin.

The 2010 Olympic and Paralympic Winter Games in Vancouver, BC had a significant impact on the passenger ropeway technology as well as all other technologies regulated by the BC Safety Authority. The BC Safety Authority's Olympic Safety Plan was developed where operations staff worked as one unit across technologies in order to quickly identify safety concerns and initiate effective control plans to achieve desired outcomes. We believe this was a fundamental contribution to the success of the games.

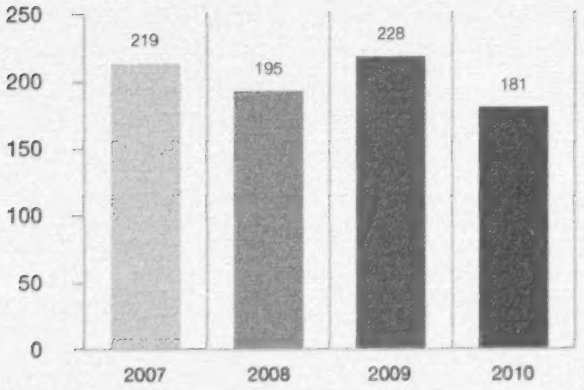
Jason Gill
Amusement Rides & Passenger Ropeways Safety Manager



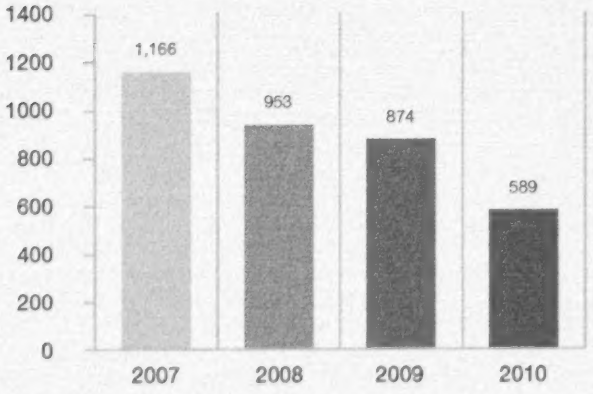
Passenger Ropeways

Inspection Activity

PR.1 Passenger Ropeways: Inspections Performed 2007-2010



PR.2 Passenger Ropeways: Non-Compliances Found on Inspection 2007-2010



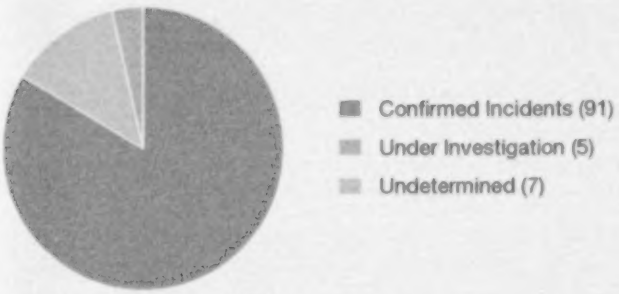
Passenger ropeways safety officers conducted almost 200 inspections in 2010 and identified almost 600 non-compliances. This shows a 21% decrease in inspection activity and 33% decrease in the number of non-compliances issued. This decrease in activity is due to additional inspections conducted in the last quarter of 2009 in preparation for the 2010 Olympic and Paralympic Winter Games. As the start of the games approached the BC Safety Authority planned to decrease on site activity at Olympic venues due to anticipated increased security.

Passenger Ropeways

Incidents in 2010

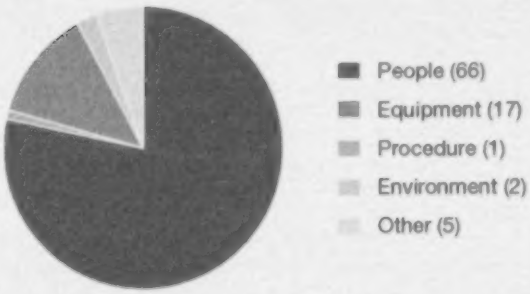
PR.3 Passenger Ropeways: Investigation Outcome of Reported Cases

Total Number of Reported Cases: 103



PR.4 Passenger Ropeways: Incidents by Identified Cause

Number of Confirmed Cases: 91



We received 103 incident notifications in 2010 resulting in one fatality, 15 serious injuries and 35 minor injuries.

An incident involving a passenger falling at the downhill loading area on a detachable chairlift resulted in a fatality during the summer. The passenger, who was loading as a foot passenger, lost her balance and fell off the loading ramp. Before loading, the passenger changed her orientation in relation to the chairlift carrier. The operator of the installation had properly setup the loading area and the actions taken by the lift operator at the time of the incident were determined to be appropriate. A similar incident also occurred at another ski area during summer operation resulting in serious injuries. We continue to investigate these incidents and may recommend changes with respect to the setup of loading areas for foot passengers during summertime operations.

A seven year old passenger was involved in a fall from a carrier on fixed grip chairlift and received serious injuries. While on the carrier, the child turned and slipped beneath the restraining bar. The passenger was riding alone and it was determined that the parents of the passenger encouraged the lift operator to allow him to do this despite the sign posted to warn patrons that children must be eight years or older to ride alone.

We continue to monitor sheave assembly alignment adjustment bolt failures that have occurred on passenger ropeways built of a specific build. It is anticipated that an ongoing analysis of these failures will result in recommendations in 2011.

Passenger Ropeways

Improving Public Safety

Operators of passenger ropeways must have a passing grade in Selkirk College's "Lift 150" program. We are reviewing a proposal to deliver the course online in addition to the traditional classroom environment. A review of courses utilized for certification must take place to ensure that they are acceptable for their intent. The Provincial Safety Manager has initiated discussion with Selkirk College to develop a Memorandum of Understanding with Selkirk College to define the roles and responsibilities with respect to course development. It is anticipated that the Memorandum of Understanding will be in place in 2011.

In 2010, we continued with our safe rider behaviour awareness campaigns. We increased our distribution points with additional placement on chairlift restraining bars, attending ski shows and distributing posters and tip cards to various ski areas. We will monitor the delivery and efficacy of this program in preventing passenger falls from chairlift carriers.

Industry & Technology Engagement

In the Passenger Ropeways Safety Program, we worked with the following organizations and committees in 2010:

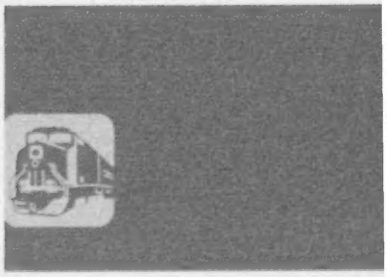
- Stakeholder Engagement
  - Passenger Ropeways and Amusement Rides Technology Advisory Committee
  - Risk Reduction Working Group on Aging Units
- Industry Associations
  - Canada West Ski Areas Association
  - International Meeting of Technical Supervisors in Ropeway Engineering (ITTAB)
  - Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games
- National Codes and Standards Committees
  - Canadian Standards Association CSA-Z98 Technical Committee

Future Outlook and Trends

A risk reduction group formed to study the issue of aging passenger ropeways in the province continued its work in 2010. The passenger ropeway technology committee formed this group to review this issue and make recommendations for future actions in this regard. This proactive initiative will ensure the continued safety of passenger ropeways in British Columbia.

In 2010, we were approached by a company that received approval to build an independent hydro electric project that required a specialized passenger ropeway to install a penstock on the side of a mountain. It was necessary for the Provincial Safety Manager to enter into an Equivalent Standards Agreement with the proponent in order to approve this installation. The proposed passenger ropeway is what is referred to as a cable crane ropeway which is not explicitly described in current national standard for passenger ropeways in Canada, and we may see increased interest and increased use of new technologies in the passenger ropeway technology. ■

Railways



In the Railway Safety Program, BC Safety Authority regulates four classes of railways: Common Carrier, Industrial Railways, Commuter Railways, and Heritage Railways.

In the Railway Safety Program at the BC Safety Authority, we regulate railways that operate solely within BC and have a Minister's Certificate issued by the BC Ministry of Transportation and Infrastructure. The Railway Safety Program is unique within BC Safety Authority as it is the only technology not governed by the *Safety Standards Act*. Instead, provincial railways are subject to the provincial *British Columbia Railway Act*, the federal *Railway Safety Act*, and the adopted federal railway safety legislation. Railway companies that operate nationally, such as CN, Canadian Pacific and VIA Rail, are not under the jurisdiction of the BC Ministry of Transportation and Infrastructure but are regulated by Transport Canada.

In the program, we regulate four classes of railways: Common Carrier (e.g. Southern Railway of BC, transporting passengers or goods and interchange rolling stock with other railways); Industrial Railways (e.g. Eurocan Pulp and Paper, serving an industrial site exclusively); Commuter Railways (e.g. SkyTrain, transporting passengers between urban locations); and Heritage Railways (e.g. Kettle Valley Steam Railway, operating historical rolling stock).

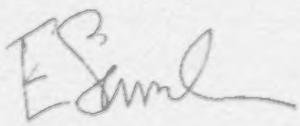
Summary

The year 2010 for the Railway Safety Program was one of growth and review within the railway industry in British Columbia.

Under our operating model, our focus was once again on high risk in the provincial railway industry. This focus included our continued work with organizations that had complex and challenging operations that presented safety concerns.

We also continued with the "Safe Rider" education program in which we partnered with industry and stakeholders to deliver safety messaging to the rail-commuting public. This education program was significant because the commuter rail operation industry expanded with the advent of the 2010 Olympic and Paralympic Winter Games. Commuter rail ridership reached new records in the province as a result of the 2010 Olympic and Paralympic Winter Games.

As we look forward to 2011, our objective is to translate what we have learned from a year of growth and review into effective, practical, and sensible railway safety in British Columbia. By solidifying our relationships we have with industry clients and stakeholders, we will achieve this objective.



Eric Samuelson
Railway Safety Manager

Railways

Audit Activity

Instead of performing inspections, the Railway Safety Program is an audit-based program. An audit comprises of a review of a railway's operation and maintenance activities against its Safety Management System. In 2010, every provincial railway received at least one annual audit. The information we gather from these audits helps to form the future direction of the program and that of the railways.

In 2010, we spent more than 3,500 hours performing audits on more than 70 provincial railways. The audits varied from small simple assessments to sophisticated audits. The main focus of our audits was railway track inspection, medical rules, and training and qualification of railway employees.

From the audits, there were more than 50 non-compliances issued to railway operations in 2010. Each of the non-compliance was resolved to satisfaction through cooperative actions and a strong safety culture that existed within the railway industry.

Accidents and Incidents in 2010

All four classes of provincial railways were required to report accidents and incidents in accordance with federal railway regulations. Unlike the reporting methods of the other technologies regulated by the BC Safety Authority, the federal requirements used both the terms "accident" and "incident" with which to report events that caused injury or damage, or created a risk of injury or damage.

Industrial Railways reported 26 accidents and incidents. Of this total, 24 were slow speed derailments caused by equipment or procedural problems. These events, however, did not cause significant equipment damage nor had any adverse impact on the environment. There were also no occasions where a railway employee or a member of the public sustained injuries.

Commuter Railways were required to report accidents and incidents that occurred on railway property (including station parking lots, entrances, and platforms), in which there were 104 reported incidents in 2010. The majority of the incidents was due to patron slips, falls, and trips and had resulted in minor injuries. Our railway safety officers also determined railway rule violations and inadequate operating procedures were not the causes on any of the reported incidents. There was one report of derailment, however, associated with an equipment failure.

Heritage Railways reported four accidents and incidents to BC Safety Authority, in which one resulted in a minor injury.

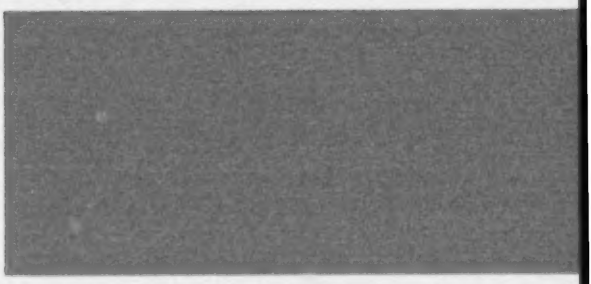
Common Carrier Railways reported 57 accidents and incidents, of which 28 of the incidents were slow speed derailments caused by equipment or procedural problems. These events, however, did not cause equipment damage or adverse environmental impact. There were a reported ten injuries, five of which were major injuries. There were two fatalities; one as the result of a railroad crossing accident, and one incident that involved the trespassing onto a railway property.

Improving Public Safety

We continued to focus on capturing unregulated work throughout the railway industry in 2010. As always, it is important that all railway operations in the province are safe and that all industry operate on a level playing field.

We also experienced continued success with our Town Hall Meeting program. In 2010, a total of 45 operators from all classes of railways attended the meetings that we held in three cities in the province (New Westminster, Trail, and Prince George). The topics for discussion included railway service provider relationships, medical requirements for critical positions, railway fees, and educational opportunities. The meetings were also ideal times to reinforce the importance for clients to report incidents to the BC Safety Authority, and how we need the data to analyze incident trends.

Railways



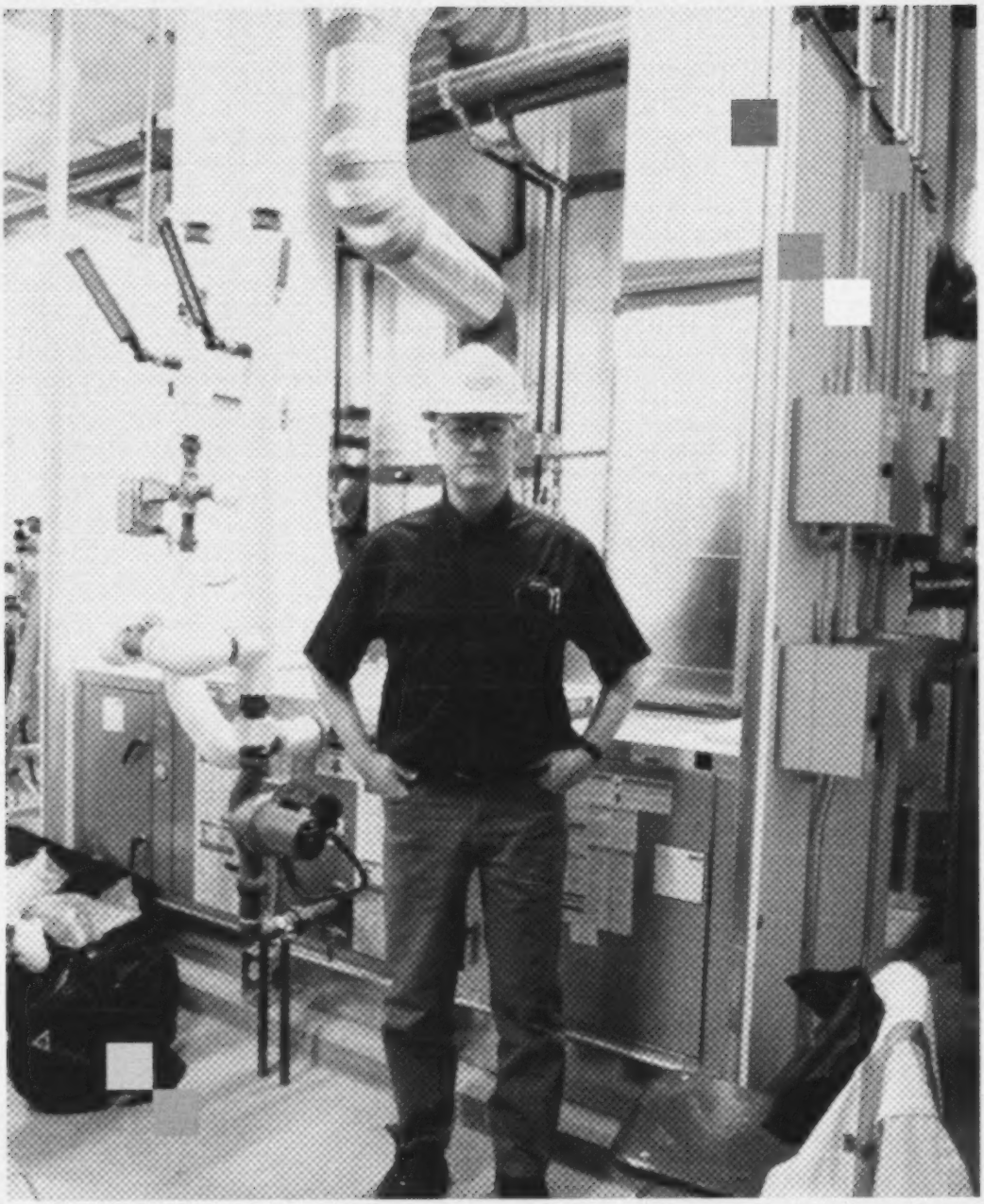
Industry & Technology Engagement

In the Railway Safety Program, we worked with the following organizations and committees in 2010:

- Ministry of Transportation and Infrastructure
- Transport Canada
- Advisory Council on Railway Safety
- Western Provincial Railway Safety Committee
- Railway Association of Canada
- Transportation Safety Board of Canada
- WorkSafeBC

Future Outlook and Trends

In 2011, we will continue to resolve the challenges within the railway industry as well as seek out further opportunities for the Railway Safety Program. Primarily, we will address the analysis from the review of the railway legislation. From the analysis, we will focus our efforts to simplify and clarify the regulatory requirements for the railway industry. The feedback received from industry on this work has been extremely positive. And, we will continue on this path with the clear understanding of improving our product and its delivery. ■



Appendix

Appendix A:

Municipalities that Administer Portions of the *Safety Standards Act*

Municipalities that Administer the *Electrical Safety Regulation*
The BC Safety Authority oversees electrical safety throughout British Columbia, with the exception of the following municipalities:

- City of Burnaby
- City of North Vancouver
- City of Surrey
- City of Vancouver
- City of Victoria
- Corporation of the District of Maple Ridge
- District of North Vancouver
- Municipality of West Vancouver

Municipalities that Administer the *Gas Safety Regulation*
The BC Safety Authority oversees gas safety throughout British Columbia, with the exception of the following municipalities:

- City of Burnaby
- City of Kelowna
- City of North Vancouver
- City of Richmond
- City of Vancouver
- Corporation of the District of Maple Ridge
- District of North Vancouver

Note: Municipalities administer gas inspection programs for detached dwellings with gas services at a pressure of 14.0 kPa gauge or less as well as other building with gas services at a pressure of 15.0 kPa gauge or less and with a total connected load for the meter of 120 kW or less. ■

Definitions

Consultation Definitions

Risk Reduction Working Group (previously Ad hoc Working Group): A group of industry subject matter experts formed to address a specific safety issue, activity or project. Risk Reduction Working Groups research, analyze, and make recommendations on a specific safety aspect to their respective Technology Advisory Committee and may be dissolved when the outcome is delivered.

Technology Advisory Committee (previously Technology Committee): A non-decision-making body comprised of volunteer industry representatives that have a primary role of identifying and advising the BC Safety Authority on issues related to technical safety, regulatory change and service delivery.

Documents and Publications

Compliance Order: A written document issued by a safety officer or safety manager stating that a person must take action, stop or modify his or her work to comply with safety standards and legislation.

Directive: A document that clarifies interpretations of code or regulation requirements; provides direction concerning how a regulation will be applied; or serves as the instrument by which a safety manager exercises a power granted under the *Safety Standards Act*.

Discipline Order: A written document issued by a safety manager to a party performing regulated work who is not in compliance with safety standards and legislation; the order may include any sanction that the safety manager considers reasonable.

Equivalent Standards Agreement: An objective-based contract made between the BC Safety Authority and a regulated company. Under this Agreement, the emphasis for safety is placed on what needs to be achieved, not how it is to be achieved.

Information Bulletin: A non-statutory and non-binding instrument that provides general information to employees, stakeholders and the public.

Monetary Penalty: An administrative penalty levied by a safety manager in amounts up to a maximum of $100,000 to penalize non-compliant behaviour.

Safety Management System: A formal framework that systematically sets out a company's rules, procedures and responsibilities with regards to safety.

Safety Order: A binding instrument issued by safety managers to prevent, avoid or reduce the risk of personal injury or damage to property.

Incident Definitions

Confirmed Incident: An incident that has established causal involvement by regulated equipment.

Disqualified as an Incident: Reported cases that do not meet the minimum requirements of an incident (as defined by the BC Safety Authority).

Incident: An event that involves technology overseen by the BC Safety Authority and either:

(a) causes death, personal injury or damage to property, or

(b) creates a risk of personal injury or damage to property.

Incident Notification: A suspected incident that has been registered with the BC Safety Authority. Following investigation, we evaluate all reported cases against the definition of an incident and classify them as either an actual "incident" or "disqualified as an incident".

Incident Causes

Environment: An incident primarily caused by or involving climate, weather or naturally occurring conditions. Examples include incidents caused by wind, lightning, earthquakes, hail, snow and mud or rock slides.

Definitions

Equipment: An incident primarily caused by or involving regulated machinery or products. Equipment-related incidents are caused by either a product failure, design flaw or manufacturing flaw.

Other: An incident involving regulated systems or regulated equipment, the cause of which cannot be attributed to the factors environment, equipment, procedure, people or undetermined.

Procedure (Formerly Leadership and Procedures): An incident primarily caused by or involving a failure to manage and adhere to established safety guidelines, processes and standards. This includes causes such as inadequate staff training, lack of staff, lack of maintenance, incorrect procedures, poor quality control and misuse of equipment.

People: An incident primarily caused by or involving human-related factors. These human factors include lack of attention, a rule violation, lack of knowledge and sabotage.

Undetermined: An incident where the primary cause cannot be assessed or confirmed. Undetermined incidents are normally the result of insufficient evidence remaining from a fire and as such it is not possible to either confirm or deny that regulated equipment caused the incident.

Unspecified: An incident where the cause was not identified when reported to the BC Safety Authority. These incidents are normally investigated by another organization and later reported to the BC Safety Authority.

Injury Classification

Major Injury: An injury that involves long-term impairment of function or loss of function of any body part, organ or mental faculty, significant physical pain and some disability or loss of function; this includes fractures, internal injuries or wounds that are serious but not life threatening and psychological trauma that results in some temporary or partial disability. Medical attention is required.

Minor Injury: A non-permanent injury that may require some medical treatment; this includes lacerations, contusions, abrasions or any other injuries that have no residual effect. Further professional medical attention is not required.

Near-Miss: An incident where no actual harm resulted, but the contributory causes are serious, and under different circumstances may have led to serious injury or death.

Inspection Definitions

Assessment: An evaluation or review that may include physical inspection or audit.

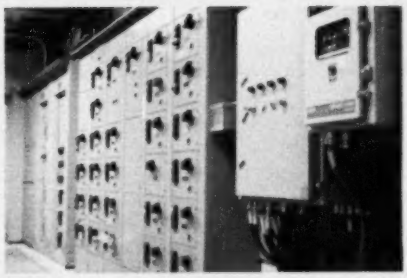
Certificate of Inspection: A report completed by a safety officer to document the inspection of regulated work and/or product.

Inspection: A physical examination of work and products to see if they meet safety requirements.

Non-Compliance: A failure to comply with a required code or safety regulation.

Risk Assessment Program: A computer program that uses risk-based principles to assign risk scores to regulated work and regulated equipment; the scores are utilized by safety officers to assist them in prioritizing inspection and audit activities to focus on higher-risk regulated work.

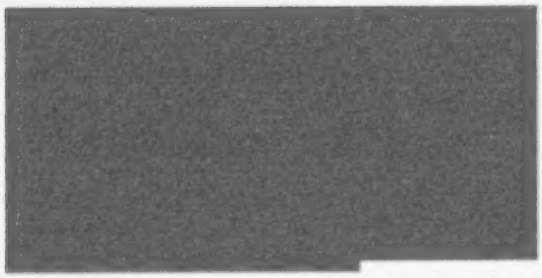
Risk-Based: A process using the product of probability and consequence to evaluate a number of factors to determine the potential hazard. ■



BC Safety Authority Executive 2010
Harry Diemer; President & Chief Executive Officer (retired March 31, 2011)
Trevor Fedyna; Vice President Corporate Services & Chief Financial Officer
Phil Gothe; Vice President Stakeholder Engagement
Shelley Milne; Corporate Secretary, Vice President Legal & Policy
Catherine Roome, P.Eng.; Chief Operating Officer
Diane Sullivan; Vice President Human Resources

BC Safety Authority Board of Directors 2010
Peter Cook, Chair
Richard Ballantyne
Hoss Budde (from April 1, 2010)
Tom Fletcher (to March 31, 2010)
Brian Fehr
Steve Lornie (from April 1, 2010)
Arthur Daniel Miller
George Morfitt (to March 31, 2010)
Daniel Mott
Janet Pau
Lorna Pawluk
Leigh Ann Shoji-Lee (from April 1, 2010)
Martha Warren (to March 31, 2010)
John Watson
Donald Young

BC Safety Authority Safety Managers 2010
Jason Gill; Amusement Rides & Passenger Ropeways
Stephen Hinde, P.Eng.; Electrical
Ed Hurd, P.Eng.; Boilers, Pressure Vessels & Refrigeration
Janice Lee, P.Eng.; Elevating Devices
Wayne Lock; Gas
Eric Samuelson; Railways



Safety Authority

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